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ENVIRONMENTAL INVESTMENTS: THE COST OF A CLEAN ENVIRONMENT

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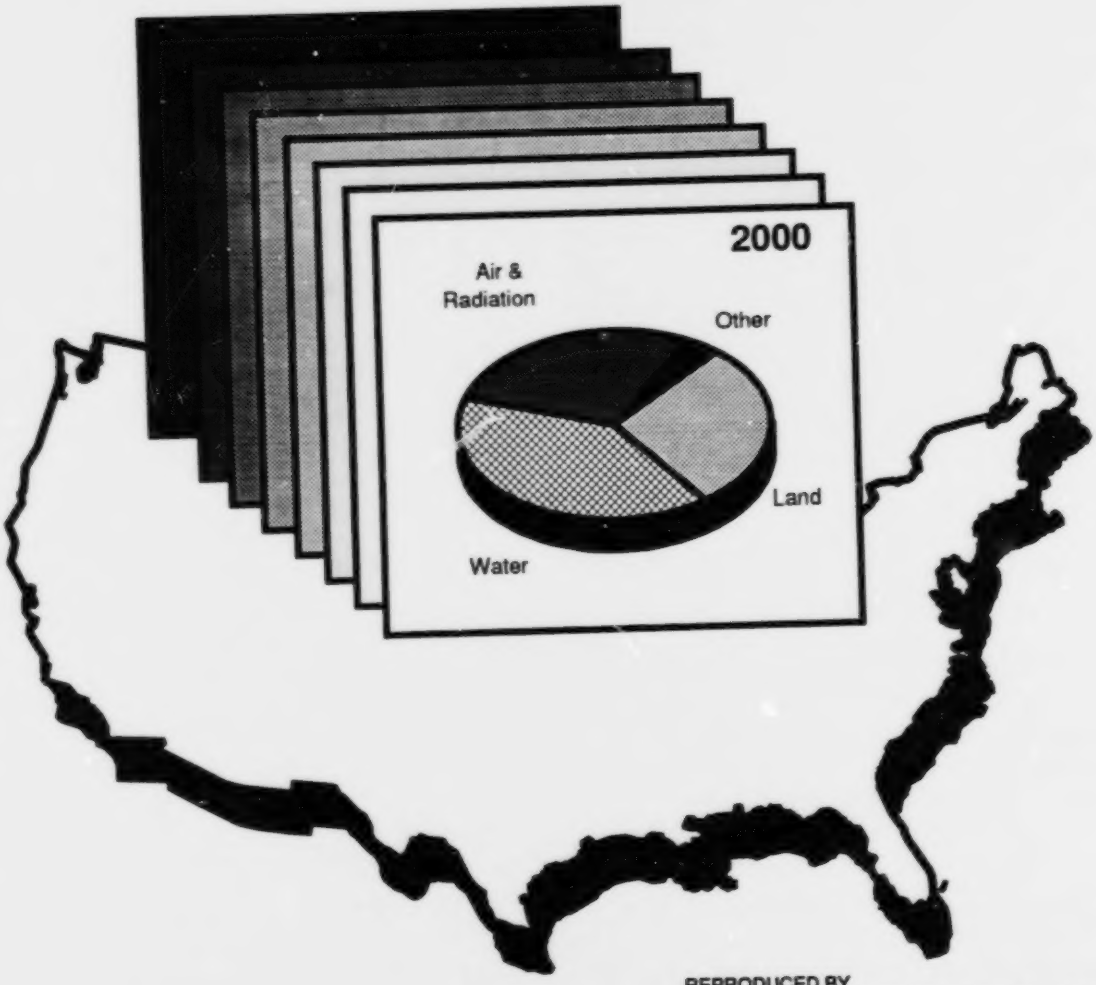

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Report of the Administrator of the
Environmental Protection Agency
to the Congress of the United States

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ADMINISTRATOR'S PREFACE

Over the past 20 years, the citizens of the United States have made a significant, enduring commitment to protecting the environment. This new report, *Environmental Investments: The Cost of a Clean Environment*, for the first time shows the full extent of this commitment—amounting to an investment of $115 billion a year in current dollars to protect and restore our nation's air, water, and land. This is just over two percent of our Gross National Product. EPA's report looks in some detail at what our country has spent, what we are spending, and what we are projected to spend on all types of pollution controls.

Of course, the country has received considerable value for these investments, and EPA has underway additional work to compile these benefits.

In the current report, a handful of points stand out:

- First, *spending on environmental problems is rising* significantly with obvious consequences for the expenditures of governments at all levels and of industry. Moreover, if the upward trend continues into the next century, this increased spending could affect U.S. competitiveness in world markets.

- Second, besides the level of spending, *the allocation of resources is changing*. The share of costs devoted to land protection is projected to rise relative to that for air and water protection over the next decade.

- Third, *the costs of pollution control are rising at a time when unmet environmental needs are still quite large*. The American people are asking for more in the way of environmental improvements and making clear politically they will not tolerate backsliding. Nor do I want to see rollbacks of hard won environmental progress. But particularly in today's economy, I am concerned about the price tag of meeting growing environmental demands.

Thus, one of my priorities at EPA is ensuring that resources devoted to achieving the nation's environmental goals are used as efficiently and effectively as possible. All EPA programs are considering the most cost-effective ways to meet the Agency's mandate consistent with our statutory responsibilities. Yet I have concluded we must redouble our efforts to find and apply more cost-effective approaches, to engage in negotiations and voluntary agreements to cut pollution, to foster breakthroughs in cleanup technologies, and to explore new ways to finance environmental improvements.

One promising approach to making environmental protection more efficient is to craft incentives that harness the marketplace on behalf of the environment. Using a combination of incentives and vigorous enforcement of existing laws, we can engage the marketplace to deal effectively with the subtle and complex environmental problems of the 1990s. These are often caused by small, widely scattered sources not always amenable to federal regulation—problems like municipal and hazardous wastes, toxic substances in the air and water, contamination of ground and surface waters from agricultural and urban runoff, and global atmospheric changes—to name some current problems with which the Agency is grappling.

A good example of this approach is the system of economic incentives proposed by President Bush to curb acid rain, which were passed by the 101st Congress in the new Clean Air Act Amendments of 1990. Under this system, electric utilities will be given a limited number of marketable permits designed to reduce their sulfur dioxide emissions by about half. EPA will monitor emissions to ensure that they do not exceed the allotted levels. If a company finds that cleanup costs are high at one plant and that purchasing additional allowances would be less expensive, it will be able to buy allowances from other utilities. On the other hand, a company may cut emissions so far that it will be able to sell its extra allowances or bank them to provide for future growth. And the plant will be able to pursue the least expensive methods of pollution control—energy conservation, different fuels, new technology—provided only that it achieves the pollution reductions the law requires. Setting the goals nationally while providing to plant and business managers, who know their operations best, the flexibility to choose the methods that work for them will achieve air quality goals at the lowest possible cost, by our estimates at perhaps one-fifth less than the cost of more traditional command and control approaches. Like other economic incentives, this emission trading system also has the advantage of promoting innovation in pollution prevention.

As part of my emphasis at EPA on economically smart approaches to environmental protection, I am increasing the use of economic analysis, strategic planning, and research. They will be used to ensure that the resources devoted to pollution control are directed towards environmental goals where the greatest reductions in environmental risks can be achieved. In this regard, EPA is in the process of using the data base developed in this report to see where our spending can be better aligned with the most serious environmental risks. We believe, for instance, that some of the environmental problems that will see the greatest expected increase in costs during the decade, as reported here, are also areas where as yet uncontrolled environmental risks may be less than originally thought. In many cases, there is no discretion under the law as to what EPA must do, and we will carry out these responsibilities as fully and vigorously as we can. In other cases, EPA proposes through its strategic planning process and review of future regulations to direct resources, where discretion is allowed, to the highest priority environmental risks.

In sum, our challenge over the next decade is to reconcile the expectations of the American people for greater environmental protection with our country's aspirations for growth. We need to deliver in the most cost-effective manner the continued public health benefits of pollution control and assure that the natural systems that sustain all human activities, including economic activities, continue to provide for generations to come.

William K. Reilly
Administrator

November 1990

EXECUTIVE SUMMARY

This report is being transmitted to Congress in response to Section 312(a) of the Clean Air Act and Section 516(b) of the Clean Water Act. Unlike previous such reports, however, it goes beyond the requirements of these sections, by presenting a broader picture of environmental pollution control expenditures reflecting the Environmental Protection Agency's broad mandate.

SUMMARY OF COSTS

The Report concludes that total annualized costs for all pollution control activities in the United States at seven percent interest have increased and are projected to increase as follows (figures for year 2000 are provided for both present and full implementation scenarios):

				2000	
Total Annualized Costs	**1972**	**1987**	**1990**	**Present**	**Full**
In billions of 1986 dollars	26	85	100	148	160
In billions of estimated 1990 dollars	30	98	115	171	185
As Percent of GNP	0.9	1.9	2.1	2.6	2.8

The present implementation option assumes that present levels of implementation of existing programs remain the same as in 1987. The full implementation option assumes that the investments needed to bring about nationwide attainment of the national ambient air quality standard for ozone and the fishable/swimmable goals of the Clean Water Act by the year 2000. The comparison with Gross National Product is intended to provide a frame of reference to allow the reader to judge the relative importance of environmental costs to a well-known aggregate measure of economic activity.

Although total annualized costs are increasing, they are increasing at a decreasing rate. The yearly rate of increase in total annualized costs decreased from 14 percent between 1972 and 1973 to six to eight percent in the mid-1980s and is projected to fail further to about three percent in the late 1990s (assuming full implementation).

The Report also provides estimates of those pollution control costs that are Federally-mandated as follows (assuming full implementation):

Federally-Mandated Annualized Costs	1972	1987	1990	2000
In billions of 1986 dollars	18	67	81	137
In billions of 1990 dollars	21	77	93	158
As Percent of GNP	0.9	1.9	2.1	2.4

Pollution control capital investment is estimated as follows (figures for year 2000 are provided for both present and full implementation scenarios):

Pollution Control Capital Investment	1972	1987	1990	2000 Present	2000 Full
In billions of 1986 dollars	20	30	41	30	39
In billions of 1990 dollars	23	35	47	35	45
As Percent of Total Capital Investment	2.5	2.3	2.8	1.7	1.9

In general, pollution control capital investment as a percentage of total capital investment, which is an important measure of the impact of pollution control costs on U.S. capital markets, reached a high in the mid-1970s at about 3.4 percent and has been trending irregularly downward since then. It is important to mention, however, that the year 2000 capital costs may be underestimated because when the data were unclear, future costs for new regulations were assigned to operating rather than capital costs.

In general, this report presents data on environmental pollution control costs during the period 1972-1987, projects these costs for each subsequent year to the year 2000 under a number of assumptions, and breaks them down in a variety of ways. These ways include differentiating between capital, operating, and annualized costs, as well as the medium where the pollution is controlled, the sector (e.g., public, private) from which the control is funded, new versus existing regulations, whether the control is primarily a result of a Federal mandate or the result of local initiative, and to the extent permitted by the data, by pollutant controlled.

The historical data are largely based on surveys of actual spending as conducted primarily by the Department of Commerce. Projections are based on simple extrapolations of spending trends as well as EPA estimates of the cost of newly implemented and proposed regulations. The Administration's January 1990 Clean Air Act reauthorization proposal was the basis for projections of future air pollution control costs.

COST COMPARISONS

The report draws five conclusions concerning cost comparisons made with the data presented:

- There is expected to be a major reallocation of the percentage of pollution control expenditures to each media over the next decade from air and particularly water pollution control to land pollution control. This is a result of the major land pollution control legislation passed by Congress beginning in the mid-1970s and greatly expanded in the 1980s. Specifically, the media shares were or are projected to be:

Media Shares of Pollution Control Expenditures (percent of total)	1987	1997
Air and Radiation Costs	28.9	27.1
Water Costs	42.9	35.7
Land Costs	26.0	33.9
Chemical Control Costs	1.2	1.9
Multi-media Costs	1.1	1.5

- Although increasing, national environmental pollution control expenditures remain less than half those for clothing and shoes, one-third those for national defense, one-third those for medical care, one-fifth those for housing, and one-sixth those for food.

- The non-EPA Federal share of total annualized pollution costs is projected to increase by more than 140 percent between 1987 and 2000, primarily as a result of the cost of military and nuclear waste clean-up. All other shares, particularly the private sector, are expected to fall somewhat. Even though the EPA share is projected to fall somewhat, the net effect is that the Federal share as a whole is projected to increase over this period while the state and local government share would decrease slightly.

- Although the percentage share of the burden on local government is expected to fall slightly change relative to that of other economic sectors, there is expected to be a significant increase in the real costs of pollution control on this sector; the result will be an increased burden on the taxpayers and rate payers, which may be burdensome for some smaller communities, unless mitigating measures are undertaken.

- National expenditures on environmental pollution control have been somewhat higher than in many Western European nations as a percentage of gross domestic product.

ENVIRONMENTAL RESULTS

The report also summarizes the available evidence concerning changes in ambient pollution levels and emissions, the "result" of the pollution control expenditures detailed in other sections of the report. An ideal comparison of the costs and benefits of pollution control would require that these benefits be identified, quantified, and monetized. This is an extremely difficult and data intensive task and is not attempted in this report.

Instead, the report relies on historical data on estimated air and water pollutant emissions and ambient pollution levels, and information on the production and regulation of hazardous waste and toxic substances to provide an indication of environmental quality levels over time. While this provides some indication of changing environmental quality levels, it does not adequately show the degree of environmental protection afforded by cumulative pollution control efforts. In the absence of controls, increasing population and levels of economic activity would have resulted in steadily decreasing environmental quality over time. In order to show environmental quality improvements resulting from pollution controls adequately, one would need to compare current levels of environmental quality indicators with estimated levels that would have prevailed in the absence of cumulative pollution control efforts. Except in the case of the criteria air pollutants emissions, such comparisons are precluded by the absence of data.

There are data, however, showing that there has been a substantial decrease in emissions of major air pollutants since 1970 compared to what they would have been without controls:

ACTUAL EMISSIONS AS A PERCENTAGE OF ESTIMATED EMISSIONS USING 1970 LEVELS OF CONTROL

Year	Particulate Matter	Sulfur Dioxide	Nitrogen Oxides	Volatile Organic Compounds	Carbon Monoxide	Lead
1984	33	71	82	60	56	19
1988	30	58	72	58	43	3

There has also been a substantial actual decrease in industrial and municipal discharges of total suspended solids into water and some improvement in biochemical oxygen demand over the same period.

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1. INTRODUCTION

Since the early 1970s, the U.S. Environmental Protection Agency (EPA) has helped carry out the national mandate to restore and protect our environmental resources. It has proven to be a massive undertaking. The Federal government, states and localities, and the private sector have all participated in this effort and expended considerable resources to implement and comply with environmental programs.

This report presents estimates of historical pollution control expenditures and projected future costs for each public sector and the private sector. The time period covered includes the years 1972-2000. Estimates of capital costs, operation and maintenance costs, and total annualized costs are presented for five categories of environmental media. The report also uses the estimates to provide some comparisons of U.S. pollution control costs with those of several Western European nations, and to raise certain issues concerning costs that appear likely to prove important over the next several years.

In addition, the report presents some historical data on pollutant emissions and ambient pollution levels—the "output" of pollution control expenditures. These data are indicators of the level of environmental quality over time that are not readily comparable to the monetary cost estimates presented in this report. Reduced pollutant emissions and improved ambient environmental quality have resulted in substantial and valuable national benefits in the form of improved human health, recreational opportunities, visibility, and general environment integrity, among others. An ideal comparison of the costs and benefits of pollution control would require that these benefits be identified, quantified, and monetized. This is a much more difficult task than showing historical trends in pollution loadings and ambient pollution levels and is beyond the scope of this report. Ongoing EPA research focuses on estimating and monetizing the quantifiable benefits of aggregate pollution control efforts; the results of this research will be reported in future publications in this series.

The remainder of this chapter discusses the nature and scope of the cost estimates, the categories of costs considered, and conventions used throughout the analysis. Chapter 2 examines briefly the data sources used. The cost estimates are presented by media in Chapters 3 through 7. Total costs are presented in Chapter 8 along with a discussion of major sources of uncertainty in these estimates. Conclusions and data on environmental quality trends are presented in Chapters 9 and 10, respectively. More detailed documentation for the cost estimates and data sources are provided in the Appendices A-J.

1.1. DEFINITION OF COSTS CONSIDERED

1.1.1. Scope of Costs

The Clean Air and Water Acts require the Administrator of the EPA to periodically collect and report to Congress estimates of the national costs to all sectors—both public and private—of carrying out the respective Acts.[1] This report presents cost estimates that fulfill these requirements. The report goes beyond the scope of these statutory directives, however, to provide cost estimates for all EPA programs pursuant to each of the major Federal environmental pollution control statutes. This provides a picture of the total direct costs of all Federal pollution control efforts, and permits cost comparisons across environmental media and major EPA program areas.

In addition, this report includes the costs of state, local, and private pollution control programs that are closely related to areas for which EPA currently has responsibility and are being pursued for the same purposes—pollution control and improved environmental quality. The most significant of these added costs are for local government and private sector trash collection and disposal. Federal legislation in the solid waste area is concerned primarily with the regulation of solid waste disposal facilities. Yet, local governments and private entities are involved with the full range of solid waste activities, including collection, handling, storage, treatment, and final disposal. Though only a relatively small portion of the total costs for these activities are incurred as a result of Federal legislation, all solid waste costs are included in this report. This is done on the grounds that all such expenditures contribute to pollution control and improved environmental quality.

This definition of costs excludes those associated with activities not directly related to pollution control. The costs of Federal environmental programs that are not pollution control programs, such as wildlife conservation and land management, are not included. In addition, the costs of non-pollution control aspects of programs that do involve pollution control are excluded. The cost of supplying drinking water, for example, is not considered an environmental cost in this report since the provision of drinking water (laying pipes and pumping water) does not contribute to pollution control. Only the costs of improving drinking water quality are included in this report. Another example of costs excluded are those associated with the treatment of incoming water used in manufacturing processes. In this case, water is treated not to improve environment quality, but rather to make it better suited to production requirements.

1.1.2. Nature of Costs

The costs presented in this report represent estimates of direct regulatory implementation and compliance costs. They are the first-order, out-of-pocket costs to those entities that implement control measures and undertake compliance activities. For example, the private costs associated with existing programs represent the before-tax expenditures associated with all compliance activities, including the purchase, installation and operation and maintenance of existing pollution control equipment; the private costs of new and future programs represent, for the most part, projections of before-tax capital investment and operation and maintenance costs calculated using engineering analyses.

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[1] Clean Air Act, Section 312(a) and Clean Water Act, Section 516(b).

These direct costs are an imperfect proxy for the social costs of pollution control regulation. The true social costs of pollution control are represented by the total value that society places on the goods and services foregone as a result of resources being diverted to environmental protection. Compliance costs do not fully reflect social costs because they neglect direct regulatory impacts that do not involve out-of pocket costs as well as the intertemporal and secondary effects of environmental protection. In other words, they do not account for the dynamic, general equilibrium effects created throughout the economy that impose costs on industries and households not directly affected by regulation. Environmental protection imposes costs on virtually all economic entities—including the general public—that are largely hidden. Examples of social costs imposed by pollution controls that are not reflected in direct compliance cost estimates include lost or delayed production and consumption opportunities, reduced economic productivity, and higher price inflation. Some recent research suggests that compliance cost estimates may understate substantially the true long-term costs of pollution control.[2]

1.2. COST CATEGORIES

The cost estimates are broken down as follows (and discussed in the sections of the report indicated):

1.2.1. By economic type;
1.2.2. By environmental medium;
1.2.3. By the sector directly incurring the cost;
1.2.4. By pollutant controlled;
1.2.5. By mandate (Federal or other);
1.2.6. By new and existing regulations; and
1.2.7. By year.

1.2.1. Costs by Economic Type

Two basic types of costs are included to represent implementation and compliance costs:

- capital costs, and
- operating costs.

From these, two aggregate cost measures are derived—annualized costs and total expenditures. Annualized costs are the aggregate cost measure used throughout most of the Report. The first table at the end of each media chapter and in most of the groups of total cost tables shows capital costs; the second shows operating costs; the third shows annualized costs. Total expenditures represent the sum of capital and operating costs. They are used only in Tables 8-18 and 8-19 of Chapter 8 and in Sections 9.1.1 through 9.1.3 of Chapter 9. The Report attempts to minimize confusion by referring to capital plus operating costs as expenditures rather than costs. Further discussion of total expenditures can be found in these Sections.

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[2] See, for example: M. Hazilla and R. Kopp, ***The Social Cost of Environmental Quality Regulations: A General Equilibrium Analysis***, Discussion Paper QE89-11, Resources for the Future, Washington, DC, March 1989.

The definitions of capital and operating costs follow those of the primary data sources used—The U.S. Department of Commerce *Government Finances* reports[3] and "Pollution Abatement and Control Expenditures" articles.[4]

Capital costs include acquisitions of plant and equipment (both replacement and expansion) and expenditures for construction in progress. They are chargeable to an establishment's accounts for plant and equipment and subject to amortization. Expenditures for research and development are excluded. For the purpose of analyzing the impact of demands for capital on financial markets, capital costs are attributed to the years in which the demand for capital occurred or is expected to occur. Capital costs as defined by the Commerce Department also include the costs of changes in production processes that reduce or eliminate the generation of pollutants, through material substitution, improved catalysts, reuse of waste or water, and equipment alteration.

Operating costs include all costs and expenses for the operation and maintenance of pollution abatement processes, including spending for materials, equipment leasing, parts and supplies, direct labor, fuel and power, services provided by private contractors, and research and development. Operating costs exclude costs associated with plant and equipment financing and depreciation, expenditures for health and safety, and payments to governmental units.

Government costs are also presented as outlays for capital and operating costs. All governmental costs for program implementation and administration are listed as operating costs.

As mentioned above, annualized costs, although not calculated and reported by the Commerce Department, are the principal aggregate cost presented in most of the Report. These are the sum of the operating costs for the year in question plus amortized capital costs, which include interest and depreciation associated with accumulated capital investment. Amortized (or annualized) capital costs represent the real resource costs of tying-up funds in the purchase and installation of capital equipment or other fixed assets required by environmental regulation. Annualized capital costs are computed using three rates of amortization—three, seven, and ten percent—and the following assumptions with regard to life of capital investment for different program areas:

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[3] U.S. Department of Commerce, Bureau of the Census, *Government Finances*, various years.

[4] U.S. Department of Commerce, Bureau of Economic Analysis, various articles often entitled "Pollution Abatement and Control Expenditures," published periodically in the *Survey of Current Business*.

Mobile source air pollution control capital	10 years;
Radiation control capital	25 years;
Water pollution control capital (except drinking water)	30 years;
Superfund remediation capital	30 years;
Underground storage tank capital	30 years;
All other capital	20 years.

The assumed life of capital for mobile sources is based on the estimated average life of motor vehicles. The stationary source air and water capital lives are based on discussions with industry experts as described in Kappler and Rutledge (1982).[5] The capital lives assumed for all other programs except radon control correspond to assumptions commonly made by EPA in Regulatory Impact Analyses for each respective program area. In the case of radiation, a 25 year capital life is based on the assumptions that most radiation control capital is for the purpose of reducing radon exposure, that the average house life is 50 years, and that the average home age at the time of radon remediation is 25 years. The three amortization rates used for annualization were chosen to include the range of most interest to readers.

1.2.2. Costs by Environmental Medium

The cost estimates are categorized into three "environmental media"—air, water, and land—as well as useful chemicals and multi-media. The fifth category, labelled "multi-media", consists of costs that do not fit well in any of the other four categories. Except in the case of chemicals, costs are allocated to the environmental medium that is most directly affected by the pollution controls associated with expenditures. There are cases, of course, where costs are incurred to reduce the threats posed by pollution that initially is released into one medium, but later impacts another. For the purposes of this report, however, costs to reduce pollutant emissions directly into a particular medium are allocated to that medium. Potentially hazardous chemicals such as pesticides differ from the pollutants associated with the other media because they have economic value and are not simply waste products. The costs of controlling risks from such chemicals are provided in the chemicals category.

As mentioned above, the allocation of pollution control costs among different environmental media categories is bound to cause some overlap and confusion due to the cross-media nature of many environmental problems and the control programs used to address them. This is particularly true for many of the program areas included under the "land" medium, which have as one of their most important objectives the prevention and reduction of groundwater contamination. Yet, because programs such as those relating to hazardous waste disposal are concerned with pollution that is initially released primarily onto land, their costs are allocated to the land medium. Despite problems of overlap, it was felt that the advantages of this categorization scheme favored its use.

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[5] Frederick G. Kappler and Gary L. Rutledge, "Stock of Plant and Equipment for Air and Water Pollution Abatement, 1980-81," *Survey of Current Business*, pp. 18-25, November, 1982.

The four major environmental media categories also correspond roughly to the four major program offices within EPA, and encompass the major pollution control laws that EPA administers. The costs associated with the statutes listed below are discussed in the sections indicated.[6]

3. Air pollution and radiation control expenditures pursuant to:
    - 3.1. Clean Air Act; and
    - 3.2. Radon Gas and Indoor Air Quality Research Act of 1986, Radon Pollution Control Act of 1988, and earlier acts.
4. Water pollution control expenditures pursuant to:
    - 4.1. Clean Water Act; Marine Protection, Sanctuaries and Research Act; and
    - 4.3. Safe Drinking Water Act.
5. Land pollution control expenditures pursuant to:
    - 5.4. Resource Conservation and Recovery Act; and
    - 5.5. Comprehensive Environmental Response, Compensation, and Liability Act.
6. Chemical control expenditures pursuant to:
    - 6.1. Toxic Substances Control Act; and
    - 6.2. Federal Insecticide, Fungicide, and Rodenticide Act.
7. Non-media-specific expenditures, including those pursuant to:
    - 7.2. Energy Security Act; and
    - 7.4. Title III of the Superfund Amendments and Reauthorization Act.

Other non-media-specific EPA costs that are administered independently of the above programs are included in the following sections:

- 7.1. Management and support; and
- 7.3. Interdisciplinary.

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[6] The major exceptions to these allocations occur in the few cases where a section of a law is administered by an EPA office other than the one that administers most of the law. In that case, the cost is accounted for where possible under the office that administers the section involved rather than the office that has primary responsibility for the law as a whole.

1.2.3. Costs by Sector

The cost estimates are also broken down by the economic sector that directly incurs them. Separate categories are included for:

- EPA costs;
- Non-EPA Federal costs;
- State government costs;
- Local government costs; and
- Private sector costs.

This classification is useful because it permits evaluation of the impacts on each of the major public sectors as well as the private sector. EPA and state government costs are primarily for program implementation, while non-EPA Federal, local government, and private costs are largely associated with compliance activities.

1.2.4. Costs by Pollutant

In the case of air pollution control, an attempt was made to break down the cost estimates by pollutant, providing a sense of the relative control costs for various environmental contaminants. Unfortunately, data limitations prevented such a breakdown of costs for the other environmental media.

1.2.5. Costs by Mandate

The report includes costs associated with all Federal pollution control programs as well as all state and local programs that are closely related to Federal initiatives. In addition, the report includes costs associated with certain local government activities and private sector initiatives directed towards improving environmental quality that do not follow from Federal mandates. The local programs include those solid waste collection and drinking water treatment activities that are not addressed by Federal laws and regulations. The private sector activities include solid waste collection, and radon removal in private homes. To distinguish the cost estimates for these programs from others presented in this report, two separate estimates of total costs are included in the environmental media categories—one for Federally-mandated costs and one for all costs.

1.2.6. New and Existing Regulatory Costs

Finally, distinctions are made between the following pollution control costs:

- **Costs of existing regulations**—costs associated with regulations and programs that were substantially in place by 1987 and have achieved substantially full compliance with standards or attainment of goals;

- **Costs of new regulations**—costs estimated to result from new or recently implemented regulations and programs (*i.e.*, those not substantially in place by 1987), and regulations currently under development or proposed by EPA; and
- **Costs of full implementation**—costs that would arise from full attainment or full compliance with those existing laws, regulations, and programs for which the attainment deadline has passed but for which there was substantially less than full attainment by 1987. They include the costs of bringing all cities except Los Angeles and New York into attainment with the national ambient air quality standard for ozone, and expenditures needed to satisfy the nation's municipal wastewater treatment needs.

The costs for existing regulations are based on survey data on historical expenditures and extrapolations from these. New regulation costs are based on *ex ante* estimates of the costs associated with new and forthcoming regulations derived in EPA regulatory impact studies. The year 1987 is selected as the cut-off date because that is the last year for which survey data was available when this Report was prepared.

The estimates used to represent full implementation costs were derived from recent EPA analyses of wastewater treatment needs and measures required to reach substantially complete attainment of ozone air quality standards. Wastewater treatment costs were derived from a report to Congress on current and future municipal needs and the estimated expenditures required to meet them. The ozone attainment costs were derived from EPA analyses of the ozone attainment costs associated with the Administration's original proposed amendments to the Clean Air Act.

In November 1990, President Bush signed the Clean Air Act Amendments of 1990. These contained provisions which are expected to result in higher costs than those contained in the Administration's original proposed amendments. As a result, the costs for the Amendments are expected to be significantly ginger by the year 2000 than the estimates presented in this Report. This is discussed further in Section 3.1.3.

1.2.7. Costs by Year

Finally, cost estimates are presented for each year over the period 1972-2000. The year 1972 was selected as the starting date because it represents the first year for which the Commerce Department collected reasonably complete cost data. The year 2000 was selected as the ending date because it is near enough so that reasonable cost projections could be made but far away enough to provide a useful perspective on future cost trends.

1.3. CONVENTIONS USED

Several conventions were followed to avoid double counting intergovernmental transfers, to project future costs, and to convert cost estimates into constant dollars. These are discussed briefly below.

1.3.1. Intergovernmental Transfers

Special care was taken to avoid double-counting intergovernmental grants. Such transfers were subtracted from non-Federal government expenditures for state and local programs that are funded in whole or part by Federal grants. In addition, for years in which the non-Federal portions of matching grant programs are not clearly identified in the national statistics, state and local shares were estimated using matching ratios over years for which data were available.[7]

1.3.2. Projection Techniques

1.3.2.1. Existing Programs

Projecting future costs for existing programs is an attempt to predict what government and private sectors will spend to maintain compliance with existing pollution control requirements in the face of a changing economy and an expanding population.

To keep this task simple, historical pollution control expenditures were linearly regressed against time and the resulting parameter estimates used to predict costs for future years. Use of this method assumes that trends in population growth, economic growth, compliance levels, and other factors that may affect pollution control costs will continue as in the recent past, and will have similar influences on expenditures. All projections were calculated at the most disaggregated level of detail—municipal operating expenses for wastewater treatment plants, for example. Aggregations to national totals were simple arithmetic exercises once the component projections were made.

The estimated equations chosen for projecting costs for any regulation or program were those that best fit the individual time series data, considering recent trends in the data, the types of spending involved, and the maturity of the individual program.[8] In a number of cases there were one or more significant changes in trend during the years for which data were available. In such cases, equations fit on the most recent clearly discernible trend were used. This is illustrated in Figure 1-1 and Table 1-1, which show private capital costs for stationary air pollution control over the years 1972-87. Since the most recent discernible cost trend in the example is over the years 1983-87, an equation fit on those years was used in this report. Trends corresponding to two longer time periods are also shown for comparison.

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[7] Local government statistics on environmental expenditures include those attributable to a range of local government units, including towns, townships, cities, regional governments, and special districts.

[8] A two-phased model of environmental capital expenditures was assumed. In the early years following a regulatory program, capital is accumulated rapidly as large numbers of regulated units make initial investments. In the second phase there is less capital accumulation, most of which is associated with investments by previously recalcitrant units and expansion due to economic and population growth. Operating expenses are directly related to the number of units in compliance, and therefore grow in tandem with capital expenditures.

One problem with using regression equations based on a small number of data points to extrapolate costs is the potential for under-or over-estimating future costs for relatively immature pollution control programs. Over-estimation is a potential problem for programs that were expanding rapidly during the period used in the model; under-estimation of future costs is a potential problem for programs that have been slow to develop since their initiation. In general, this does not appear to be a problem for the relatively old air and water programs, in which relatively few new rules have been implemented in recent years. The projection problem is probably of greatest concern for certain existing programs included under the land medium; specifically, the Resource Conservation and Recovery Act (RCRA) program which regulates all facets of current hazardous waste handling and disposal activities, and the Superfund hazardous waste remediation program.

RCRA hazardous waste costs increased significantly over the mid-1980s. Cost data for these years were used in a linear regression model to predict future costs associated with existing rules. The resulting estimates show significantly increasing future costs for existing hazardous waste programs. When these estimates are added to estimates of costs associated with new and forthcoming RCRA rules, the totals may over-estimate hazardous waste costs over the next several years. To check for potential upward bias in the estimates, a comparison was made between the rates of growth in projected costs for the existing hazardous waste program and the much older solid waste program. This comparison showed that the rate of growth in projected hazardous waste costs is less than for solid waste, and within reasonable bounds over the period 1988-2000. Despite this encouraging result, there may be some degree of upward bias in the RCRA hazardous waste cost projections.

In the case of the Superfund remediation program, future costs projections were based on cost estimates for years 1981-1989, which covers the full period of the program's existence. Superfund costs increased relatively slowly over the first five years, but have increased more dramatically since 1986. Since the costs projections are based on data for the entire period, there is no compelling reason to think the projections might significantly under- or over-estimate actual future expenditures.

1.3.2.2. New Regulations

For new and not fully implemented regulations and programs, this report used cost estimates contained in EPA's Regulatory Impact Analyses (RIAs). Capital costs were gathered from the RIAs associated with new regulations identified in each EPA program area. Future capital costs are presented both as annual demands for capital and on an annualized basis.

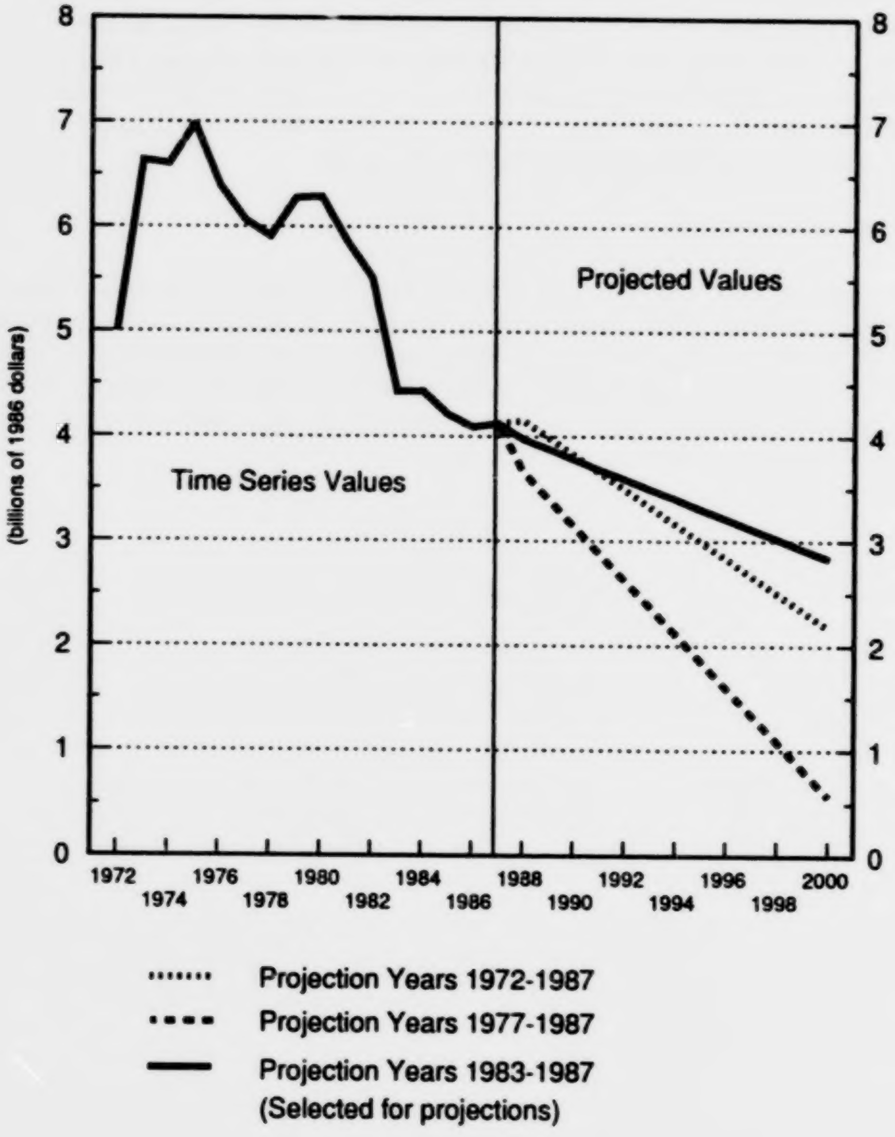
To show the timing of capital costs for new regulations, capital costs were typically spread out in equal lumps over a relatively few years. This method of showing demands for capital results in graphs with erratic changes in aggregate capital costs from year to year. In practice, control capital is typically phased in more gradually over time, imposing smoother demands for capital over a five to ten year compliance period.

Operation and maintenance (O&M) costs for new regulations were also derived from the RIAs. For the most part, O&M costs were assumed to begin one year after a capital investment is made and to continue through the expected useful life of the capital facility. Under these assumptions, annual O&M costs peak in the year after the last increment of capital is put in place, and continue at this level throughout the useful life of the capital. In certain cases, only annualized cost estimates were available for new or forthcoming regulations. In such cases, these estimates were reported under the O&M cost category.

1.3.3. Price Deflators Used

All cost estimates are shown in 1986 dollars. The price deflators shown in Table 1-1 were used to convert current dollars in to 1986 dollars. These include indices developed by the Bureau of Economic Analysis of the U.S. Department of Commerce for air, water, and solid waste costs, and the GNP implicit price index. For other media and programs, the GNP price index was used for operating costs, and the Construction Cost index compiled by the *Engineering News Record* was used for capital costs.

Fig. 1-1: PROJECTION TECHNIQUES ILLUSTRATED



SOURCE: Table 3-1

Table 1-1: PROJECTION TECHNIQUES ILLUSTRATED
Private Capital Costs for Stationary Air Pollution

Standard Error		35.957	37.513	24.371
Degrees of Freedom		14	9	3
R Squared		0.600	0.840	0.835
Predictor Variables		1972-1987	1977-1987	1983-1987
Historical Data	1972	4,994	4,994	4,994
	1973	6,628	6,628	6,628
	1974	6,601	6,601	6,601
	1975	6,983	6,983	6,983
	1976	6,387	6,387	6,387
	1977	6,061	6,061	6,061
	1978	5,908	5,908	5,908
	1979	6,276	6,276	6,276
	1980	6,288	6,288	6,288
	1981	5,860	5,860	5,860
	1982	5,508	5,508	5,508
	1983	4,425	4,425	4,425
	1984	4,433	4,433	4,433
	1985	4,207	4,207	4,207
	1986	4,090	4,090	4,090
	1987	4,122	4,122	4,122
Projections	1988	4,148	3,653	3,971
	1989	3,984	3,396	3,876
	1990	3,819	3,139	3,781
	1991	3,654	2,881	3,686
	1992	3,490	2,624	3,591
	1993	3,325	2,366	3,496
	1994	3,160	2,109	3,401
	1995	2,996	1,851	3,306
	1996	2,831	1,594	3,212
	1997	2,666	1,336	3,117
	1998	2,501	1,079	3,022
	1999	2,337	822	2,927
	2000	2,172	564	2,832

SOURCE: Table 3-1

Table 1-2: PRICE DEFLATORS INDEXED TO 1986

Year	Gen Indexes		Air Pollution			Water Pollution			Solid Waste		
	ENR	GNP	Cap	O&M	Govt	Cap	O&M	Govt	Cap	O&M	Govt
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
1972	0.408	0.437	0.435	0.310	0.393	0.390	0.341	0.396	0.373	0.388	0.386
1973	0.441	0.461	0.448	0.338	0.418	0.413	0.362	0.426	0.390	0.420	0.418
1974	0.470	0.497	0.504	0.464	0.493	0.471	0.429	0.469	0.432	0.466	0.461
1975	0.515	0.537	0.560	0.508	0.555	0.516	0.490	0.496	0.489	0.495	0.494
1976	0.559	0.566	0.595	0.531	0.591	0.549	0.528	0.529	0.523	0.525	0.524
1977	0.599	0.594	0.629	0.576	0.631	0.589	0.572	0.569	0.568	0.552	0.553
1978	0.646	0.632	0.673	0.617	0.674	0.638	0.616	0.629	0.622	0.579	0.583
1979	0.699	0.685	0.735	0.735	0.740	0.704	0.676	0.702	0.684	0.635	0.639
1980	0.753	0.748	0.803	0.889	0.817	0.765	0.769	0.757	0.762	0.681	0.687
1981	0.823	0.818	0.876	0.986	0.890	0.839	0.854	0.816	0.848	0.778	0.782
1982	0.890	0.869	0.923	1.007	0.943	0.884	0.911	0.851	0.907	0.835	0.840
1983	0.947	0.904	0.939	1.018	0.956	0.922	0.938	0.900	0.947	0.876	0.882
1984	0.965	0.941	0.966	1.043	0.989	0.968	0.976	0.928	0.968	0.920	0.924
1985	0.977	0.974	0.984	1.064	0.998	0.994	0.995	0.983	0.970	0.957	0.959
1986	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
1987	1.026	1.035	1.014	1.016	1.004	1.015	1.009	1.031	1.053	1.037	1.040
1988	1.052	1.071	1.122	1.224	1.143	1.123	1.145	1.107	1.143	1.084	1.090
1989	1.072	1.113	1.165	1.280	1.189	1.170	1.196	1.153	1.193	1.130	1.136
1990	1.090	1.153	1.209	1.335	1.235	1.216	1.246	1.199	1.243	1.175	1.182

Footnotes to Table 1-2 by column:

(2) Construction Cost Index history, 1906-1990, *Engineering News Record*, March 26, 1990 (used for capital costs where BEA indexes were not available) indexed to 1986.

(3) Fixed-weighted price indexes for gross national product, 1959-1987 *Economic Report of the President 1988*, Table B-4 (used for operating and maintenance costs where BEA indexes were not available) indexed to 1986. Indexes for 1989 and 1990 based on inflation factors of 1.036 and 1.039 respectively.

(4-12) Figures in columns 4 through 12 are selected fixed-weighted price indexes constructed by the U.S. Department of Commerce, Bureau of Economic Analysis, indexed to 1986. The 1972-1982 indexes are taken from Farber, "Pollution Abatement and Control Expenditures," *Survey of Current Business*, July, 1986, Table 9. The 1983-1987 indexes are taken from Farber, *op. cit.*, 1989, Table 6. Indexes for 1988-1990 are linear projections based on 1972-1987 data.

(4,7,&10) Cap: Business pollution control capital costs (line 49)

(5,8,&11) O&M: Business pollution control operating and maintenance costs (line 50)

(6,9,&12) Govt: Government pollution control capital costs and operating and maintenance costs (line 51)

2. DATA SOURCES

Table 2-1 presents an overview of the data sources and methodologies used to derive the cost estimates. It differentiates between actual cost data for years 1972-87 and estimated costs for years 1988-2000.

As discussed in sections 1.2.6 and 1.3.2, there is a basic difference between the estimates of future costs for established programs and costs for new and forthcoming regulations. To estimate costs for established regulations, estimates of recent historical costs for pollution control programs were extrapolated to future years, usually 1988-2000. This projection method assumes that future annual costs for existing programs will follow recent trends. For new and forthcoming regulations, cost estimates for years 1988-2000 are based primarily on data derived from EPA regulatory analyses.

Also provided are cost estimates that reflect full compliance with certain established programs for which the deadline for complete implementation has passed, but compliance is predicted to be less than full even with predicted future expenditures. This is in accordance with the Clean Air and Water Act provisions requiring estimates of full compliance costs. All the above is summarized in Table 2-1.

The cost estimates were derived from five principal data sources. These are listed below along with the sections in which they are discussed.

2.1. U.S. Department of Commerce survey data on historical private and government expenditures;

2.2. EPA budget justification data on historical EPA expenditures;

2.3. EPA regulatory impact analyses data for new and proposed regulations; and

2.4. Special EPA analyses data for programs not covered by other data sources.

Table 2-2 lists the data sources for the historical cost estimates in more detail corresponding to the organization of the remainder of this report.

2.1. U.S. DEPARTMENT OF COMMERCE SURVEY DATA

The basic source of pre-1988 data for private, non-EPA Federal, state, and local costs is the U.S. Department of Commerce. Data on private expenditures over the years 1959-1987 were obtained from a series of articles entitled "Pollution Abatement and Control Expenditures" (PACE reports) which are published periodically in the *Survey of Current Business* by the Bureau of Economic Analysis (BEA). These articles compile and organize data derived from a number of sources, including two key agency surveys—the "Pollution Abatement Costs and

Expenditures Survey" (PACE Survey) and the "Pollution Abatement Plant and Equipment Survey," (PAPE Survey)—which are conducted annually by the Census Bureau for BEA.

The basic source of past non-EPA Federal expenditures for pollution control is surveys completed by each Federal agency detailing their pollution control expenditures. Completed surveys are submitted to BEA for inclusion in the PACE reports.

Data on state and local expenditures for the years 1972-87 are primarily from the results of an annual survey on governmental expenditures conducted by the Census Bureau and published in a series of annual reports entitled *Government Finances*. The data, which are reported for fiscal years, were converted into calendar years.[1] Federal grants in each program area were subtracted from total expenditures, and interest on debt, where reported, was netted from annual expenditure data to isolate O&M costs.

Data on state and local expenditures for air pollution control were obtained from the PACE reports published in the *Survey of Current Business*.

2.2. EPA BUDGET JUSTIFICATION DATA

The main source of data for EPA expenditures is the *Justification of Appropriation Estimates for Committee on Appropriations*. Outlays are shown for Fiscal Years 1972 through 1989. Budget projections of outlays are shown for Fiscal Years 1990 and 1991, as reported in an annual attachment entitled "Summary of Budget Authority, Obligations, Outlays, and Workyears by Media."

2.3. REGULATORY IMPACT ANALYSES DATA

The basic source of data for new and forthcoming regulations are Regulatory Impact Analyses (RIAs) and similar EPA analyses of major EPA regulations. RIAs have been prepared prior to the issuance of each major regulation since 1981, and include data on estimated compliance costs and benefits. Similar analyses for costs only were issued under different names before 1981. Table 2-3 lists those regulations for which RIA cost estimates have been used in this report; Appendix A contains summary information for each of these rules.

2.4. SPECIAL EPA ANALYSES DATA

Where the above data sources did not provide adequate or reliable data, special analyses conducted by EPA program offices or contractors were used. In general, this is the case for those programs not involving air, water, or solid waste, since these are the media covered by the Commerce Department data. Cost estimates for the Superfund program, for example, relied on a special analysis. In addition, a special EPA analysis was undertaken to estimate the costs of air mobile source control because of particular EPA expertise in this area, and because the Commerce Department data on mobile sources are not based on direct Commerce Department survey data.

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[1] To derive estimates for calendar year 1986, for example, one-half of the reported Fiscal Year 1986 estimate was added to one-half of the reported fiscal year 1987 estimate.

Table 2-1: PRINCIPAL DATA SOURCES BY TIME PERIOD

Program/ Sector	**1972-1987**	**1988-2000**	
		Current Implementation	**Full Implementation**
	Existing Regulations		
EPA	EPA Budget (see section 2.2)	Projections based on historical costs (see section 1.3.2.1)	Not applicable
Non-EPA Federal	Commerce--BEA (see section 2.1)	Projections based on historical costs	Not applicable
State Government	Commerce--*Government Finances* (see section 2.1)	Projections based on historical costs	Not applicable
Local Government	Commerce--*Government Finances* (see section 2.1)	Projections based on historical costs	Special analysis (see section 2.4)
Private	Commerce--BEA (see section 2.1)	Projections based on historical costs	Special analysis (see section 2.4)
	New regulations and programs		
All Sectors	Not applicable	Regulatory Impact Analysis estimates (see section 2.3)	Not applicable

Table 2-2: DATA SOURCES FOR HISTORICAL COSTS BY ENVIRONMENTAL MEDIUM

		Sector Impacted				
Report Section	**Program**	**EPA**	**Non-EPA**	**State**	**Local**	**Private**
3.	**Air & Radiation**					
3.1	Air					
3.1.1	Stationary Sources	Budget outlays	BEA surveys	Not available	Not available	Commerce--BEA
3.1.2	Mobile Sources	Budget outlays	Not available	Not available	Not available	Special analysis
4.	**Water**					
4.1	Water Quality					
4.1.1	Point Source	Budget outlays	BEA surveys	Census *Government Finances*—Sanitation + 20% of natural resources net of Federal Grants	Census *Government Finances*—Sanitation + 20% of natural resources net of Federal Grants	Commerce—BEA
4.1.2	Non-Point Source	Special analysis	Special analysis	Special analysis	Special analysis	Special analysis
4.2	Drinking Water	Budget outlays	Not available	Special analysis using ASDWA survey	Special analysis using AWWA surveys; Commerce study; ODW EIAs	Special analysis
5.	**Land**					
5.1	Solid Waste	OSW Subtitle D estimate	BEA surveys	Census *Government Finances*—sanitation other than sewage	Census *Government Finances*—sanitation other than sewage	Commerce—BEA
5.2	Hazardous Waste	OSW budget minus Subtitle D	Special analysis	Not available	Not available	Commerce—BEA
5.3	LUST	Trust Fund outlays	Not available	Not available	Not available	Not available
5.5	Superfund	Budget outlays	Special analysis	Special analysis	Not available	Special analysis
6.	**Chemicals**					
6.1	Toxic Substances	Budget outlays	BEA surveys	Not available	Not available	Special analysis
6.2	Pesticides	Budget outlays	BEA surveys	Special analysis	Not available	Special analysis
7.	**Multi-Media**					
7.1	Management	Budget outlays	Not available	Not available	Not available	Not available
7.2	Energy	Budget outlays	Not available	Not available	Not available	Not available
7.3	Interdisciplinary	Budget outlays	Not available	Not available	Not available	Not available
7.4	SARA Title III	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
7.5	Undesignated	Not available	BEA surveys	Not applicable	Not applicable	Not applicable

(Footnotes to Table 2-2 on next page)

Explanation of Terms Used in Table 2-2

ASDWA survey: Association of State Drinking Water Agencies, "Survey of State Programs."

AWWA surveys: American Water Works Association (AWWA), "Research Foundation Survey on Trihalomethanes" and "Member Survey: 1984 Water Utility Operating Data".

Commerce study: U.S. Department of Commerce, *The 1977 Market for Water and Wastewater Treatment Equipment*.

ODW-EIA: U.S. EPA Office of Drinking Water, various "Economic Impact Analyses" for regulated drinking water pollutants.

Census—Government Finances: U.S. Department of Commerce, Bureau of the Census, *Government Finances*, various years.

Commerce—BEA: U.S. Department of Commerce, Bureau of Economic Analysis, various articles often entitled "Pollution Abatement and Control Expenditures," published annually in the *Survey of Current Business*.

BEA surveys: Data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

OSW budget: Budget for the Office of Solid Waste, U.S. Environmental Protection Agency.

Table 2-3: INDIVIDUAL REGULATIONS INCLUDED IN THE COST ANALYSIS

Report Section/Media/Regulation		Reason for Inclusion
3.	**Air and radiation**	
3.1	Air	
3.1.1	Stationary sources	
	Particulate Matter National Ambient Air Quality Standard	New
	Lead National Ambient Air Quality Standard (Revisions)	Proposed
	Acid Rain Control	In development
	Toxic Substances Control	In development
	Expeditious Attainment of Ozone National Ambient Air Quality Standard	Non-attainment—existing
	Stratospheric Ozone Protection Plan	New
3.1.2	Mobile Sources	
	Fuel Volatility Rule	New
	Diesel Fuel Standards	New
	Nitrogen Oxides and Particulate Standards for Light-Duty Trucks & Heavy-Duty Engines	New
	Expeditious Attainment of Ozone National Ambient Air Quality Standard	Non-attainment—existing
3.2	Radiation	
	Radon Advisory	New

Table 2-3A: INDIVIDUAL REGULATIONS INCLUDED IN THE COST ANALYSIS

	Report Section/Media/Regulation	Reason for Inclusion
4.	**Water**	
4.1	Water Quality	
	Treatment of Municipal Wastewater	Non-attainment—existing
	Pretreatment Requirements	New
	Sewage Sludge Disposal—Technical Requirements	Proposed
	Stormwater Management	Proposed
	Effluent Limitation Guideline: Organic Chemicals and Plastic Fibers Industry	New
	Effluent Limitation Guideline: Offshore Oil and Gas Industry	Proposed
4.4	Drinking Water	
	Volatile Organics	New
	Fluorides	New
	Total Coliforms	New
	Surface Water Treatment	New
	Phase II Inorganics and Synthetic Organics	Proposed
	Lead, Copper, and Corrosion Control	Proposed
	Mandatory Disinfection	In development
	Radionuclides	In development
	Phase IV Inorganics and Synthetic Organics	In development

Table 2-3B: INDIVIDUAL REGULATIONS INCLUDED IN THE COST ANALYSIS

	Report Section/Media/Regulation	Reason for Inclusion
5.	**Land**	
5.1	Solid Waste	
	Municipal Landfill Subtitle D Criteria	Proposed
	Municipal Waste Combusters Air Standards	In development
	Municipal Waste Combusters Ash Disposal	In development
	Management of Used Oil	Proposed
5.2	Hazardous Waste	
	Land Disposal Restrictions—California List Wastes	New
	Land Disposal Restrictions—Solvent and Dioxin-Containing Wastes	New
	Land Disposal Restrictions—First Third Wastes	New
	Land Disposal Restrictions—Second Third Wastes	New
	Land Disposal Restrictions—Third Third Wastes	Proposed
	Underground Injection: Solvents and Dioxin Waste Disposal Restrictions	New
	Underground Injection: California List and First Third Waste Disposal Restrictions	New
	Underground Injection: Second Thirds Waste Disposal Restrictions	New
	Underground Injection: Third Thirds Waste Disposal Restrictions	Proposed
	Toxicity Characteristics Rule	Proposed
	Location Standards Rule	In development
	Corrective Action for Solid Waste Management Units	Proposed
	Minimum Technology Rule	New
	Hazardous Waste Tanks Rule	New
	Small Quantity Generators Rule	New

Table 2-3C: INDIVIDUAL REGULATIONS INCLUDED IN THE COST ANALYSIS

	Report Section/Media/Regulation	Reason for Inclusion
5.3	Underground Storage Tanks (USTs)	
	USTs Containing Petroleum—Financial Responsibility Requirements	New
	USTs Containing Petroleum—Technical Requirements	New
5.5	Superfund	
	Site Clean-Ups	Less than full implementation
6.	**Chemicals**	
6.1	Toxic substances	
	Asbestos in Schools Rule	New
	Asbestos in Products Ban/Phasedown	New
7.	**Multi-media**	
7.4	SARA Title III Regulations	
	Emergency and Hazardous Chemical Inventory Forms and Community Right-to-Know Reporting Requirements	New
	Extremely Hazardous Substances List and Threshold Planning Quantities; Emergency Planning and Release Notification Requirements	New
	Toxic Chemical Release Reporting; Community Right-to-Know	New
	Trade Secret Claims	New

3. COSTS OF AIR AND RADIATION POLLUTION CONTROL

The costs of air and radiation control are broken down into several categories which are discussed in the sections listed below:

3.1. Air pollution control;
3.1.1. Stationary sources;
3.1.2. Mobile sources;
3.2. Radiation control; and
3.3. Total air pollution and radiation control costs.

Costs are shown in two separate ways—by funding source (government and private) and by pollutant controlled. Costs by funding source are shown in Tables 3-1 through 3-3. Costs by pollutant are shown in Tables 3-4 through 3-6.

Each group of tables provides data on three types of cost—capital, operation and maintenance, and total annualized. Capital costs are summarized in Tables 3-1 and 3-4. Operating costs are shown in Tables 3-2 and 3-5. Annualized costs are contained in Tables 3-3 and 3-6. Annualized costs are calculated using capital amortization rates of three, seven, and ten percent, and an assumed capital life of 20 years for stationary sources and ten years for mobile sources.

The discussion that follows focuses on the annualized cost estimates calculated using an amortization rate of seven percent for capital costs. Annualized costs calculated at a three percent rate are approximately nine to 15 percent lower, and those calculated at ten percent are approximately eight to 12 percent higher, than the estimates discussed below.

3.1. AIR POLLUTION CONTROL

EPA regulatory programs governing air pollution control have been carried out in accordance with the Clean Air Act (CAA) of 1970 as amended in 1977. The program consists of an integrated approach to attainment of National Ambient Air Quality Standards (NAAQS) for several criteria pollutants, including: emission control requirements on stationary sources; emission control requirements on mobile sources; ambient air quality monitoring to assess status; and comprehensive state and regional air quality planning to assure progress towards attainment. The CAA also provides for control of specially designated hazardous air pollutants.

In November, 1990 President Bush signed into law the Clean Air Act Amendments of 1990, which are expected to substantially increase costs to control the precursors of acid precipitation, urban ozone, and air toxics. This Report was prepared using January 1990 EPA estimates of the original Administration proposal for revisions to the Clean Air Act. The impact of the new Amendments on total costs will be discussed further in Section 3.1.3 below.

Annualized costs for stationary sources, mobile sources, and both sources combined, are discussed separately below. Within each category is a discussion of "full implementation" costs, which represent the costs of substantially attaining the current NAAQS for ozone by the year 2000.

3.1.1. Stationary Sources

Stationary source air pollution control costs, on an annualized basis, have increased steadily since the passage of the Clean Air Act in 1970. The biggest jump in costs occurred over the years immediately following passage of the Act, driven primarily by large expenditures for new capital equipment. Stationary source costs more than doubled between the years 1972 and 1979, reaching an estimated $12.9 billion. In the years following, annualized costs increased at a less dramatic rate due to falling annual expenditures for new capital, reaching $19 billion in 1987.

Stationary source costs are expected to rise significantly over the 1990s as the nation makes another push to attain existing ozone standards, and introduces new acid rain control measures and regulations on a large number of hazardous air pollutants. The Administration's proposed strategies for addressing ozone non-attainment, acid rain and air toxics, if enacted and implemented within the next few years, would push total annualized costs for stationary sources up to an estimated $25 billion by 1995, and to $29.7 billion by the year 2000.

The additional costs for attaining the ambient air standard for ozone in those urban areas currently not meeting the standard are presented in the "full implementation" cost category (discussed in Section 1.2.5) since they represent costs of meeting existing standards. The costs of regulating acid rain precursors and hazardous air pollutants, on the other hand, are included under the "new regulations" cost category since these are more in the nature of new programs.

Only partial information is available on historical stationary air pollution costs broken down by pollutant controlled, and is limited to private sector costs. This information is derived from capital cost estimates for the years 1973-86 reported in the Commerce Department's PACE reports published in the *Survey of Current Business*. All other air costs by pollutant were estimated using various assumptions and procedures which are detailed in Appendix B. Due to the many assumptions required to derive total air pollution control costs by pollutant controlled, these estimates should be viewed as highly uncertain.

The available data shows that particulates and sulfur oxides together accounted for over 80 percent of total annualized stationary source control costs in the first few years after passage of the Clean Air Act. While these two pollutants maintained a large share of total expenditures for all pollutants throughout the 1970s, the costs of controlling volatile organic compounds (VOCs) increasingly took on added significance. By 1980, expenditures for the control of particulates accounted for an estimated 55 percent of total annualized costs, sulfur oxides 17 percent, and VOCs 15 percent.

In the 1980s, expenditures for the control of VOCs became even more significant. By 1988, the share of total costs accounted for by particulates had decreased to 48 percent, the share for sulfur oxides had decreased to 15 percent, while the share of total costs accounted for by VOCs had increased to 21 percent. The upward trend in VOC control costs is expected to continue into the future as the nation directs its air pollution control efforts towards attainment of the existing ambient air quality standard for ozone.

In the future, VOCs may account for the largest share of total control costs of any particular pollutant. Additionally, expenditures for the control of hazardous air pollutants and sulfur oxides would increase significantly during the 1990s if the Administration's strategies for addressing acid rain and air toxics are enacted and implemented within the next few years.

3.1.2. Mobile Sources

The mobile source costs presented in this report represent the results of a special analysis prepared for EPA rather than the costs reported in the Commerce Department's PACE series. Pollution control costs for mobile sources are presented for the private sector only; they represent costs to purchasers and users of all mobile sources of air pollution. The general trends in total mobile source costs are discussed in this section, while cost estimates for individual vehicle types and the detailed assumptions and conventions used in their derivation are discussed in Appendix C.

Total annualized costs for mobile source emissions control increased steadily from $1.3 billion in 1972 to $7.5 billion in 1987. The original mobile source regulations sought to control two conventional air pollutants, hydrocarbons (HC) and carbon monoxide (CO), from both cars and trucks. Light-duty vehicle control costs consistently contribute between 65 and 75 percent of these costs. This is because passenger cars comprise the majority of motor vehicles in use and Federal regulation has focused to a greater degree on this vehicle class.

The increase in annualized costs over time is due primarily to steadily increasing capital costs. The steady, moderate rise in capital expenditures reflects a succession of more stringent standards requiring improved pollution control devices on an increasing number of vehicles and vehicle classes.

Trends in operation and maintenance (O&M) costs have been much more erratic. O&M costs increased steadily from 1972 through 1974, and then began to decline for two reasons. First, EPA estimates that maintenance costs actually became a maintenance cost savings with the introduction of catalytic devices in 1975. This is because catalytic devices require the use of unleaded fuels that extend the longevity of exhaust systems and spark plugs. Second, the cost associated with a reduction in fuel economy due to pollution controls began to decline significantly beginning in 1975 as pollution control equipment became less of a burden on fuel efficiency. EPA estimates that the advent of the three-way catalysts in 1982 actually improved fuel efficiency. EPA also estimates that operating costs resulting from premiums paid for unleaded fuels will be eliminated in 1990, as the price differential between unleaded and leaded fuels reaches zero.

The net effect of these changes is that EPA estimates of mobile source O&M costs begin to decline in 1975 and actually become a cost saving in 1989, and this savings is projected to increase significantly over the period 1990-2000. This greatly lowers total annualized costs for mobile sources over the period 1975-2000. Other sources of mobile source cost estimates—such as the U.S. Department of Commerce PACE reports—do not recognize any beneficial effects of pollution control devices on O&M costs, and thus report significantly higher overall costs for mobile source pollution control.

In the 1990s, new and forthcoming regulations are expected to significantly increase total annualized costs for mobile source pollution control. These regulations are aimed at: (1) strengthening tailpipe emission control requirements for passenger cars and light-duty trucks; (2) reducing hazardous constituents in fuels; and (3) initiating new control requirements for heavy-duty diesel engines. These regulations are expected to add an additional $1.2 billion in annualized control costs by 1995, increasing to $3.3 billion by the year 2000. These new requirements will push total annualized mobile source costs to an estimated $11 billion in 1995 and to over $14 billion by the year 2000.

In addition, a host of other mobile source initiatives would be needed in order for the nation to reach the ambient air quality standard for ozone. The Administration's strategy for ozone attainment, if enacted and fully implemented within the next few years, would add an additional $1.3 billion in annualized mobile source control costs by 1993, increasing to $1.4 billion by year 2000.

3.1.3. Total Air Pollution

On an annualized basis, total air pollution control costs increased steadily since the passage of the Clean Air Act in 1970. Total costs increased from almost $8 billion in 1972 to nearly $27 billion in 1987. Stationary source control costs accounted for approximately 67-74 percent of total costs during this period. In the future, costs associated with existing programs are expected to rise only slightly. However, the Clean Air Act Amendments of 1990 mentioned in Section 3.1 above would significantly increase total air pollution control costs in the coming years. The Administration's original proposal for attaining the ambient air quality standard for ozone would add $4.3 billion in annual control costs by 1993, $5.4 billion by 1997, and over $6.5 billion by the year 2000. Additionally, the Administration's proposed strategies for regulating the precursors to acid precipitation and hazardous air pollutants would add an additional $2 billion by 1995, increasing to almost $6 billion by the year 2000. In sum, the January 1990 EPA estimates of the original Administration proposal would have pushed total annualized air pollution costs to over $34.5 billion by 1993, to $39.7 billion by 1997, and to $44 billion by the year 2000. Stationary source costs would account for approximately 67 percent of total future air pollution control costs.

The estimated costs for the original Administration proposal were later adjusted upward due to revisions in air toxics cost estimates. The costs of both the Senate and House versions of the Amendments were estimated to be higher than the original Administration proposal, mainly due to requrements for tighter tailpipe standards, reformulated gasoline, and oxygenated fuels. Due to these modifications, the cost of the Clean Air Act Amendments may be significantly higher by the year 2000 than the estimates used in preparing this Report.

3.2. RADIATION CONTROL

The EPA Office of Radiation Programs administers a variety of programs involving several very unique regulatory and non-regulatory initiatives. For the most part, however, these are either prospective requirements or requirements shared with other Federal agencies. Thus, historical and current levels of compliance expenditures are relatively low, and probably much less than those that will be incurred in the long-term future.

Annualized costs to EPA and non-EPA Federal agencies for existing radiation programs increased from an estimated $18 million in 1972 to a little over $200 million in 1980, and to over $300 million in 1987. Costs to Federal agencies for existing radiation programs are estimated to nearly double the 1987 level by the year 2000. Data on radiation control costs borne by private entities and state and local governments for existing radiation programs are not available.

Under the Uranium Mine Tailings And Reclamation Act, EPA has regulations in place directed to controlling contamination of groundwaters near uranium mines. These regulations are the source of compliance expenditures, but these costs were not collected for this report.

EPA has issued regulations governing the handling of high level radioactive wastes from power plants. However, these regulations currently impose no compliance costs because all nuclear power plant wastes are now being stored on-site as an interim measure until final disposal issues are resolved.

3.2.1. Radon

In the last few years EPA has undertaken a major new effort to reduce population exposure to radon gas. Radon is an odorless, invisible, radioactive gas found in many of the nation's buildings. It is thought to be the second leading cause of lung cancer in this country. The radon abatement effort was strengthened by the passage of two new laws, the Radon Gas and Indoor Air Quality Research Act of 1986 and the Radon Pollution Control Act of 1988. The EPA role is primarily one of studying the problem, educating the public, and providing information, technology, and other aid to states to assist them in developing radon control programs.

Although EPA has not required radon mitigation in private homes and buildings, the country has incurred modest costs for radon control. Estimates of these costs are based primarily on data gathered in surveys carried out for EPA in New York and the Washington, D.C. areas. There is considerable uncertainty in the estimates because the surveys were limited to only two regions, and the data gathered is far from comprehensive. (More detail on the surveys and the radon cost estimates are presented in Appendix D). The survey data, and projections for future years based on this data, suggest that private annualized expenditures for radon testing and mitigation were $6 million in 1988, and will increase to an estimated $71 million by 1993, and to $180 million by the year 2000. Because these costs are not pursuant to Federal mandates, they are not included in the estimates of total Federally-mandated costs.

3.3. TOTAL AIR POLLUTION AND RADIATION CONTROL COSTS

On an annualized basis, total air and radiation pollution control costs have increased steadily since the passage of the Clean Air Act. Total costs increased from $7.9 billion in 1972 to an estimated $27 billion in 1987. Radiation programs accounted for less than two percent of these costs. In the future, costs are expected to rise by a much slower rate in the absence of new initiatives aimed at attaining the ambient air standard for ozone, controlling the precursors to acid rain, and regulating hazardous air pollutants. If the Administration's strategies for addressing ozone, acid rain, and air toxics are enacted and implemented within the next few years, however, they would add an estimated $5.8 billion in control costs by 1995, and an estimated $14.6 billion by the year 2000. Assuming this scenario comes to pass, total annualized air and radiation pollution control costs would reach $44 billion by the year 2000.

Table 3-1: AIR AND RADIATION POLLUTION CONTROL CAPITAL COSTS BY FUNDING SOURCE

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	EPA															
	Non-EPA Federal			108	132	130	111	83	74	59	42	34	59	40	41	38
	State & Local Govt	160	196	211	184	264	312	304	385	487	507	539	442	421	329	312
	Private	4,994	6,628	6,601	6,983	6,387	6,061	5,908	6,276	6,288	5,860	5,508	4,425	4,433	4,207	4,090
	Total Stationary	5,155	6,824	6,920	7,299	6,781	6,484	6,295	6,735	6,834	6,409	6,081	4,925	4,894	4,577	4,440
	Federally Mandated	5,155	6,824	6,920	7,299	6,781	6,484	6,295	6,735	6,834	6,409	6,081	4,925	4,894	4,577	4,440
3.1.2	Mobile Sources															
	EPA															
	Non-EPA Federal															
	State & Local Govt															
	Private	268	564	472	2,775	3,256	3,548	3,685	4,010	3,716	4,189	4,049	4,812	6,125	6,664	6,885
	Total Mobile	268	564	472	2,775	3,256	3,548	3,685	4,010	3,716	4,189	4,049	4,812	6,125	6,664	6,885
	Federally Mandated	268	564	472	2,775	3,256	3,548	3,685	4,010	3,716	4,189	4,049	4,812	6,125	6,664	6,885
3.1.3	Undesignated Source															
	EPA															
	Non-EPA Federal															
	State & Local Govt															
	Total Undesignated															
	Federally Mandated															
3.1.4	Total Air Pollution	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
	Federally Mandated	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
3.2	Radiation															
	EPA															
	Non-EPA Federal			24	20	16	8	25	22	64	89	30	37	33	55	47
	State Government															
	Local Government															
	Private															
	Total Radiation			24	20	16	8	25	22	64	89	30	37	33	55	48
	Federally Mandated			24	20	16	8	25	22	64	89	30	37	33	55	47
3.3	Total Air & Rad	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,373
	Federally Mandated	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,372

Footnotes to Table 3-1

EPA Stationary Sources: Assumed to be zero; EPA air expenses are assumed to be operating costs.

Non-EPA Federal Stationary Sources: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

State and Local Government: From Appendix B, Table B-10.

Private Stationary Sources: From Appendix B, Table B-5.

Stationary Federally Mandated: Assumed to be 100 percent of the total costs of stationary air pollution regulations.

Private Mobile Sources: From Appendix C, Table C-1.

Mobile Federally Mandated: Assumed to be 100 percent of the total costs of mobile air pollution regulations.

Undesignated Federally Mandated: Assumed to be 100 percent of the total costs of undesignated air pollution regulations.

Non-EPA Federal Radiation: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Radiation Federally Mandated: Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Total Air & Radiation Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations. Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Table 3-1A: AIR POLLUTION CONTROL CAPITAL COSTS BY FUNDING SOURCE

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	EPA															
	Non-EPA Federal	38	41	40	40	39	38	38	37	37	36	36	35	35	34	34
	State & Local Govt	312	276	253	227	200	174	148	121	95	69	42	16	(10)	(37)	(63)
	Private	4,090	4,122	3,971	3,876	3,781	3,686	3,591	3,496	3,401	3,306	3,212	3,117	3,022	2,927	2,832
	Total Existing Regs	4,440	4,438	4,264	4,142	4,020	3,898	3,777	3,655	3,533	3,411	3,290	3,168	3,046	2,924	2,803
	Federally Mandated	4,440	4,438	4,264	4,142	4,020	3,898	3,777	3,655	3,533	3,411	3,290	3,168	3,046	2,924	2,803
	New Regulations															
	Local Government															
	Private		477	477	477	106	106	106								
	Total New Regs		477	477	477	106	106	106								
	Full Implementation															
	Total Stationary	4,440	4,915	4,741	4,619	4,126	4,004	3,883	3,655	3,533	3,411	3,290	3,168	3,046	2,924	2,803
	Federally Mandated	4,440	4,915	4,741	4,619	4,126	4,004	3,883	3,655	3,533	3,411	3,290	3,168	3,046	2,924	2,803
3.1.2	Mobile Sources															
	Existing Regulations															
	EPA															
	Non-EPA Federal															
	State & Local Govt															
	Private	6,885	6,653	6,788	6,476	6,566	6,729	6,871	7,066	7,217	7,367	7,468	7,623	7,732	7,844	7,956
	Total Existing Regs	6,885	6,653	6,788	6,476	6,566	6,729	6,871	7,066	7,217	7,367	7,468	7,623	7,732	7,844	7,956
	Federally Mandated	6,885	6,653	6,788	6,476	6,566	6,729	6,871	7,066	7,217	7,367	7,468	7,623	7,732	7,844	7,956
	New Regulations															
	Local Government															
	Private			96	97	97	147	151	156	186	191	197	203	210	216	223
	Total New Regs			96	97	97	147	151	156	186	191	197	203	210	216	223
	Full Implementation															
	Total Mobile	6,885	6,653	6,883	6,573	6,663	6,876	7,022	7,222	7,403	7,559	7,665	7,827	7,941	8,061	8,179
	Federally Mandated	6,885	6,653	6,883	6,573	6,663	6,876	7,022	7,222	7,403	7,559	7,665	7,827	7,941	8,061	8,179
3.1.3	Undesignated Source															
	EPA															
	Non-EPA Federal															
	State & Local Govt															
	Total Undesignated															
	Federally Mandated															
3.1.4	Total Air Pollution	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981
	Federally Mandated	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981

Footnotes to Table 3-1A

Existing EPA Stationary Sources: Assumed to be zero; EPA air expenses are assumed to be operating costs.

Existing Non-EPA Federal Stationary Sources: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1983-1986.

Existing State and Local Government: Figures for 1987-1988 from Appendix B, Table B-10. Linear projection of expenditures for 1988-2000 based on historical data for the years 1985-1987.

Existing Private Stationary Sources: 1986-1987 data from Appendix B, Table B-5. Linear projection of expenditures for 1988-2000 based on historical data for the years 1983-1987.

Existing Stationary Federally Mandated: Assumed to be 100 percent of the total costs of existing stationary air pollution regulations.

New Private Stationary Sources: Estimated on the basis of the regulations and sources listed in Appendix A.

Full Implementation: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Stationary Federally Mandated: Assumed to be 100 percent of the total costs of stationary air pollution regulations.

Existing Private Mobile Sources: From Appendix C, Table C-1A.

Existing Mobile Federally Mandated: Assumed to be 100 percent of the total costs of existing mobile air pollution regulations.

New Private Mobile Sources: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Mobile Federally Mandated: Assumed to be 100 percent of the total costs of mobile air pollution regulations.

Undesignated Federally Mandated: Assumed to be 100 percent of the total costs of undesignated air pollution regulations.

Total Air Pollution Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations.

Table 3-1B: RADIATION POLLUTION CONTROL CAPITAL COSTS BY FUNDING SOURCE

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	EPA															
	Non-EPA Federal	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
	State Government															
	Local Government															
	Private															
	Total Existing	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
	Federally Mandated	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
	New Regulations															
	Local Government															
	Private	1	4	34	79	79	94	89	93	98	103	107	112	117	122	127
	Total New Regs	1	4	34	79	79	94	89	93	98	103	107	112	117	122	127
	Full Implementation															
	Total Radiation	48	60	90	145	151	171	171	180	190	201	210	220	230	240	251
	Federally Mandated	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
3.3	Total Air & Rad	11,373	11,628	11,714	11,337	10,940	11,051	11,076	11,057	11,126	11,171	11,165	11,215	11,218	11,225	11,232
	Federally Mandated	11,372	11,624	11,680	11,258	10,861	10,957	10,987	10,964	11,028	11,068	11,058	11,103	11,101	11,103	11,105

Footnotes to Table 3-1B

: Assumed to be 100 percent of total federal radiation costs.

New Private Radiation: Estimated expenditures for radon control from Appendix D, Table D-1.

Total Radiation Federally Mandated: Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Total Air & Radiation Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations. Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Table 3-2: AIR AND RADIATION POLLUTION CONTROL OPERATING COSTS BY FUNDING SOURCE

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	EPA											[126]	[116]	[127]	[133]	[134]
	Non-EPA Federal			168	166	220	244	261	165	185	157	147	174	200	270	186
	State & Local Govt	343	359	394	348	338	363	390	423	441	406	396	410	420	455	507
	Private	5,400	5,491	5,021	5,243	5,935	6,626	7,194	7,377	7,072	6,938	6,540	7,331	7,715	7,914	8,571
	Total Stationary	5,744	5,850	5,583	5,756	6,494	7,234	7,845	7,965	7,698	7,501	7,083	7,915	8,335	8,639	9,264
	Federally Mandated	5,744	5,850	5,583	5,756	6,494	7,234	7,845	7,965	7,698	7,501	7,083	7,915	8,335	8,639	9,264
3.1.2	Mobile Sources															
	EPA											[15]	[16]	[17]	[18]	[20]
	Non-EPA Federal															
	State & Local Govt															
	Private	1,307	2,118	2,082	1,828	1,597	1,494	1,293	1,027	836	443	192	269	114	(3)	236
	Total Mobile	1,307	2,118	2,082	1,828	1,597	1,494	1,293	1,027	836	443	192	269	114	(3)	236
	Federally Mandated	1,307	2,118	2,082	1,828	1,597	1,494	1,293	1,027	836	443	192	269	114	(3)	236
3.1.3	Undesignated Source															
	EPA	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Non-EPA Federal															
	State & Local Govt															
	Total Undesignated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Federally Mandated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
	Federally Mandated	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
3.2	Radiation															
	EPA	18	17	14	18	12	10	9	12	15	15	13	15	12	16	13
	Non-EPA Federal			239	210	141	158	220	210	189	163	182	164	171	181	301
	State Government															
	Local Government															
	Private															
	Total Radiation	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
	Federally Mandated	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
3.3	Total Air & Rad	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045
	Federally Mandated	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045

Footnotes to Table 3-2

EPA Stationary Sources: Data from the 1990 President's Budget Justification Document. All EPA costs are included in the undesignated category (i.e., undesignated between stationary and mobile sources) because a distinction between stationary and mobile sources has not been possible to make for all years. The brackets indicate years where that distinction was possible. The numbers in brackets are included for illustrative purposes only and are not included as part of total costs. If done uniformly for all air categories, the corresponding numbers for the undesignated category would be those shown minus the bracketed numbers in stationary and mobile.

Non-EPA Federal Stationary Sources: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

State and Local Government: From Appendix B, Table B-10.

Private Stationary Sources: From Appendix B, Table B-7.

Existing Stationary Federally Mandated: Assumed to be 100 percent of the total costs of existing stationary air pollution regulations.

Total Stationary Federally Mandated: Assumed to be 100 percent of the total costs of stationary air pollution regulations.

EPA Mobile Sources: Data from the 1990 President's Budget Justification Document. All EPA costs are included in the undesignated category (i.e., undesignated between stationary and mobile sources) because a distinction between stationary and mobile sources has not been possible to make for all years. The brackets indicate years where that distinction was possible. The numbers in brackets are included for illustrative purposes only and are not included as part of total costs. If done uniformly for all air categories, the corresponding numbers for the undesignated category would be those shown minus the bracketed numbers in stationary and mobile.

Private Mobile Sources: From Appendix C, Table C-1.

Existing Mobile Federally Mandated: Assumed to be 100 percent of the total costs of existing mobile air pollution regulations.

Total Mobile Federally Mandated: Assumed to be 100 percent of the total costs of mobile air pollution regulations.

Undesignated Source: Represents air expenses not designated by source as either stationary or mobile; air pollution control costs for undesignated sources are assumed to be all operating costs.

Undesignated Federally Mandated: Assumed to be 100 percent of the total costs of undesignated air pollution regulations.

Total Air Pollution Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations.

EPA Radiation: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays).

Non-EPA Radiation: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Radiation Federally Mandated: Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Total Air & Radiation Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations. Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Table 3-2A: AIR POLLUTION CONTROL OPERATING COSTS BY FUNDING SOURCE

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	EPA	[134]	[132]	[130]	[135]	[137]	[139]	[141]	[143]	[144]	[146]	[148]	[150]	[152]	[153]	[155]
	Non-EPA Federal	186	243	258	274	289	305	320	336	351	366	382	397	413	428	444
	State & Local Govt	507	507	487	496	505	515	524	534	543	553	562	572	581	591	600
	Private	8,571	9,189	8,887	8,887	9,373	9,616	9,859	10,102	10,345	10,588	10,831	11,074	11,317	11,560	11,803
	Total Existing Regs	9,264	9,939	9,632	9,657	10,168	10,436	10,704	10,972	11,239	11,507	11,775	12,043	12,311	12,579	12,846
	Federally Mandated	9,264	9,939	9,632	9,657	10,168	10,436	10,704	10,972	11,239	11,507	11,775	12,043	12,311	12,579	12,846
	New Regulations															
	Local Government															
	Private			17	35	52	62	77	210	391	1,031	1,548	1,738	2,053	2,731	3,888
	Total New Regs			17	35	52	62	77	210	391	1,031	1,548	1,738	2,053	2,731	3,888
	Full Implementation								3,042	3,053	3,084	3,490	3,897	4,301	4,708	5,114
	Total Stationary	9,264	9,939	9,649	9,692	10,220	10,498	10,781	14,224	14,683	15,622	16,813	17,678	18,665	20,018	21,848
	Federally Mandated	9,264	9,939	9,649	9,692	10,220	10,498	10,781	14,224	14,683	15,622	16,813	17,678	18,665	20,018	21,848
3.1.2	Mobile Sources															
	Existing Regulations															
	EPA	[20]	[20]	[21]	[22]	[23]	[24]	[25]	[26]	[27]	[28]	[29]	[30]	[31]	[33]	[34]
	Non-EPA Federal															
	State & Local Govt															
	Private	236	238	213	(136)	(1,766)	(1,694)	(1,623)	(1,549)	(1,459)	(1,372)	(1,320)	(1,246)	(1,191)	(1,153)	(1,135)
	Total Existing Regs	236	238	213	(136)	(1,766)	(1,694)	(1,623)	(1,549)	(1,459)	(1,372)	(1,320)	(1,246)	(1,191)	(1,153)	(1,135)
	Federally Mandated	236	238	213	(136)	(1,766)	(1,694)	(1,623)	(1,549)	(1,459)	(1,372)	(1,320)	(1,246)	(1,191)	(1,153)	(1,135)
	New Regulations															
	Local Government															
	Private				134	134	375	484	438	389	1,035	1,718	2,401	3,083	3,065	3,049
	Total New Regs				134	134	375	484	438	389	1,035	1,718	2,401	3,083	3,065	3,049
	Full Implementation								1,326	1,345	1,505	1,522	1,537	1,553	1,568	1,440
	Total Mobile	236	238	213	(2)	(1,632)	(1,319)	(1,139)	215	275	1,168	1,920	2,692	3,445	3,480	3,354
	Federally Mandated	236	238	213	(2)	(1,632)	(1,319)	(1,139)	215	275	1,168	1,920	2,692	3,445	3,480	3,354
3.1.3	Undesignated Source															
	EPA	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
	Non-EPA Federal															
	State & Local Govt															
	Total Undesignated	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
	Federally Mandated	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	9,731	10,427	10,083	9,916	8,823	9,480	9,863	14,655	15,170	16,997	18,935	20,568	22,303	23,686	25,386
	Federally Mandated	9,731	10,427	10,083	9,916	8,823	9,480	9,863	14,655	15,170	16,997	18,935	20,568	22,303	23,686	25,386

Footnotes to Table 3-2A

Existing EPA Stationary Sources: Data from the 1990 President's Budget Justification Document. All EPA costs are included in the undesignated category (i.e., undesignated between stationary and mobile sources) because a distinction between stationary and mobile sources has not been possible to make for all years. The brackets indicate years where that distinction was possible. The numbers in brackets are included for illustrative purposes only and are not included as part of total costs. If done uniformly for all air categories, the corresponding numbers for the undesignated category would be those shown minus the bracketed numbers in stationary and mobile.

Existing Non-EPA Federal Stationary Sources: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing State and Local Government: Figures for 1987-1988 from Appendix B, Table B-10. Linear projection of expenditures for 1988-2000 based on historical data for the years 1982-1987.

Existing Private Stationary Sources: 1986-1987 data from Appendix B, Table B-7. Linear projection of expenditures for 1988-2000 based on historical data for the years 1973-1987.

Existing Stationary Federally Mandated: Assumed to be 100 percent of the total costs of existing stationary air pollution regulations.

New Private Stationary Sources: Estimated on the basis of the regulations and sources listed in Appendix A.

Full Implementation: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Stationary Federally Mandated: Assumed to be 100 percent of the total costs of stationary air pollution regulations.

Existing EPA Mobile Sources: Data from the 1990 President's Budget Justification Document. All EPA costs are included in the undesignated category (i.e., undesignated between stationary and mobile sources) because a distinction between stationary and mobile sources has not been possible to make for all years. The brackets indicate years where that distinction was possible. The numbers in brackets are included for illustrative purposes only and are not included as part of total costs. If done uniformly for all air categories, the corresponding numbers for the undesignated category would be those shown minus the bracketed numbers in stationary and mobile.

Existing Private Mobile Sources: From Appendix C, Table C-1A.

Existing Mobile Federally Mandated: Assumed to be 100 percent of the total costs of existing mobile air pollution regulations.

New Private Mobile Sources: Estimated on the basis of the regulations and sources listed in Appendix A.

Full Implementation: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Mobile Federally Mandated: Assumed to be 100 percent of the total costs of mobile air pollution regulations.

Undesignated Federally Mandated: Assumed to be 100 percent of the total costs of undesignated air pollution regulations.

Total Air Pollution Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations.

Table 3-2B: RADIATION POLLUTION CONTROL OPERATING COSTS BY FUNDING SOURCE

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	EPA	13	18	14	19	25	27	29	32	35	38	41	43	46	49	52
	Non-EPA Federal	301	263	283	303	323	342	362	382	402	422	442	461	481	501	521
	State Government															
	Local Government															
	Private															
	Total Existing	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
	Federally Mandated	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
	New Regulations															
	Local Government															
	Private	0	0	3	8	14	20	25	31	36	42	48	53	59	65	71
	Total New Regs	0	0	3	8	14	20	25	31	36	42	48	53	59	65	71
	Full Implementation															
	Total Radiation	314	281	300	330	362	389	417	445	473	502	530	558	587	615	644
	Federally Mandated	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
3.3	Total Air & Rad	10,045	10,708	10,383	10,246	9,185	9,869	10,280	15,100	15,643	17,499	19,465	21,126	22,889	24,301	26,030
	Federally Mandated	10,045	10,708	10,380	10,237	9,171	9,850	10,255	15,069	15,607	17,457	19,417	21,072	22,830	24,236	25,959

Footnotes to Table 3-2B

Existing EPA Radiation: 1986-1990 data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on historical data for the years 1986-1990.

Existing Non-EPA Federal Radiation: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing Radiation Federally Mandated: Assumed to be 100 percent of total federal radiation costs.

New Private Radiation: Estimated expenditures for radon control from Appendix D, Table D-1.

Total Radiation Federally Mandated: Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Total Air & Radiation Federally Mandated: Assumed to be 100 percent of the total costs of air pollution regulations. Assumed to be 100 percent of total federal radiation costs and 0 percent of private radon costs.

Table 3-3: AIR AND RADIATION POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	EPA															
	Non-EPA Federal			178	189	255	289	314	225	251	227	220	253	282	356	276
	State & Local Govt	359	393	447	419	434	489	544	613	677	690	731	787	836	902	984
	Private	5,872	6,588	6,741	7,622	8,918	10,181	11,306	12,081	12,370	12,789	12,911	14,120	14,922	15,518	16,561
	Total Stationary	6,230	6,981	7,366	8,229	9,607	10,959	12,164	12,920	13,298	13,706	13,862	15,159	16,041	16,777	17,821
	Federally Mandated	6,230	6,981	7,366	8,229	9,607	10,959	12,164	12,920	13,298	13,706	13,862	15,159	16,041	16,777	17,821
3.1.2	Mobile Sources															
	EPA															
	Non-EPA Federal															
	State & Local Govt															
	Private	1,345	2,236	2,268	2,409	2,642	3,043	3,367	3,672	4,010	4,213	4,501	5,182	5,832	6,269	7,025
	Total Mobile	1,345	2,236	2,268	2,409	2,642	3,043	3,367	3,672	4,010	4,213	4,501	5,182	5,832	6,269	7,025
	Federally Mandated	1,345	2,236	2,268	2,409	2,642	3,043	3,367	3,672	4,010	4,213	4,501	5,182	5,832	6,269	7,025
3.1.3	Undesignated Source															
	EPA	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Non-EPA Federal															
	State & Local Govt															
	Total Undesignated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Federally Mandated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
	Federally Mandated	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
3.2	Radiation															
	EPA	18	17	14	18	12	10	9	12	15	15	13	15	12	16	13
	Non-EPA Federal			241	214	146	164	228	220	204	186	208	193	203	217	341
	State Government															
	Local Government															
	Private															
	Total Radiation	18	17	255	232	158	173	237	232	219	201	220	207	215	233	355
	Federally Mandated	18	17	255	232	158	173	237	232	219	201	220	207	215	233	354
3.3	Total Air & Rad	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431
	Federally Mandated	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431

Footnotes to Table 3-3

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2, plus amortized capital costs assuming an interest rate of seven percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Table 3-1 since 1972.

Table 3-3A: AIR POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Footnotes to Table 3-3B

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2B, plus amortized capital costs assuming an interest rate of seven percent and a capital life of 25 years on the accumulated capital investment shown in Tables 3-1 and 3-1B since 1972.

Table 3-3C: AIR AND RADIATION POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	EPA															
	Non-EPA Federal			175	182	245	276	299	208	232	207	199	230	259	331	250
	State & Local Govt	354	383	432	398	407	452	500	559	609	608	634	678	716	774	847
	Private	5,736	6,272	6,246	6,937	8,059	9,157	10,122	10,727	10,845	11,104	11,077	12,165	12,847	13,329	14,261
	Total Stationary	6,090	6,655	6,853	7,517	8,711	9,886	10,921	11,493	11,686	11,919	11,910	13,074	13,822	14,434	15,357
	Federally Mandated	6,090	6,655	6,853	7,517	8,711	9,886	10,921	11,493	11,686	11,919	11,910	13,074	13,822	14,434	15,357
3.1.2	Mobile Sources															
	EPA															
	Non-EPA Federal															
	State & Local Govt															
	Private	1,338	2,215	2,235	2,306	2,457	2,769	3,000	3,205	3,450	3,547	3,740	4,315	4,822	5,161	5,825
	Total Mobile	1,338	2,215	2,235	2,306	2,457	2,769	3,000	3,205	3,450	3,547	3,740	4,315	4,822	5,161	5,825
	Federally Mandated	1,338	2,215	2,235	2,306	2,457	2,769	3,000	3,205	3,450	3,547	3,740	4,315	4,822	5,161	5,825
3.1.3	Undesignated Source															
	EPA	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Non-EPA Federal															
	State & Local Govt															
	Total Undesignated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Federally Mandated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
	Federally Mandated	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
3.2	Radiation															
	EPA	18	17	14	18	12	10	9	12	15	15	13	15	12	16	13
	Non-EPA Federal			240	213	144	162	225	217	199	178	199	183	192	205	328
	State Government															
	Local Government															
	Private															
	Total Radiation	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
	Federally Mandated	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
3.3	Total Air & Rad	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755
	Federally Mandated	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755

Footnotes to Table 3-3C

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2, plus amortized capital costs assuming an interest rate of three percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Table 3-1 since 1972.

Table 3-3D: AIR POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Footnotes to Table 3-3D

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2A, plus amortized capital costs assuming an interest rate of three percent and a capital life of ten years for mobile sources and 20 years for all other capital on the accumulated capital investment shown in Tables 3-1 and 3-1A since 1972.

Table 3-3E: RADIATION POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	EPA	13	18	14	19	25	27	29	32	35	38	41	43	46	49	52
	Non-EPA Federal	328	293	316	340	364	388	413	438	463	488	514	540	566	591	617
	State Government															
	Local Government															
	Private															
	Total Exist Radiation	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
	Federally Mandated	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
	New Regulations															
	Local Government															
	Private	0	1	5	15	25	36	47	58	69	81	93	105	117	130	143
	Total New Regs	0	1	5	15	25	36	47	58	69	81	93	105	117	130	143
	Full Implementation															
	Total Radiation	341	312	335	374	415	452	489	528	567	607	647	688	730	770	812
	Federally Mandated	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
3.3	Total Air & Rad	21,755	23,116	23,490	23,972	23,543	24,821	25,505	30,404	30,881	32,591	34,426	36,014	37,697	39,040	40,688
	Federally Mandated	21,755	23,116	23,485	23,957	23,517	24,785	25,458	30,346	30,811	32,510	34,334	35,910	37,580	38,910	40,545

Footnotes to Table 3-3E

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2B, plus amortized capital costs assuming an interest rate of three percent and a capital life of 25 years on the accumulated capital investment shown in Tables 3-1 and 3-1B since 1972.

Table 3-3F: AIR AND RADIATION POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	EPA															
	Non-EPA Federal			181	194	263	300	327	240	267	244	238	272	302	377	298
	State & Local Govt	362	401	460	436	458	519	582	660	735	759	813	879	938	1,012	1,101
	Private	5,987	6,856	7,161	8,204	9,646	11,049	12,311	13,231	13,665	14,219	14,468	15,779	16,683	17,376	18,514
	Total Stationary	6,349	7,257	7,802	8,834	10,367	11,869	13,220	14,131	14,667	15,222	15,518	16,929	17,924	18,765	19,912
	Federally Mandated	6,349	7,257	7,802	8,834	10,367	11,869	13,220	14,131	14,667	15,222	15,518	16,929	17,924	18,765	19,912
3.1.2	Mobile Sources															
	EPA															
	Non-EPA Federal															
	State & Local Govt															
	Private	1,350	2,253	2,295	2,492	2,791	3,265	3,663	4,051	4,464	4,752	5,117	5,885	6,650	7,166	7,996
	Total Mobile	1,350	2,253	2,295	2,492	2,791	3,265	3,663	4,051	4,464	4,752	5,117	5,885	6,650	7,166	7,996
	Federally Mandated	1,350	2,253	2,295	2,492	2,791	3,265	3,663	4,051	4,464	4,752	5,117	5,885	6,650	7,166	7,996
3.1.3	Undesignated Source															
	EPA	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Non-EPA Federal															
	State & Local Govt															
	Total Undesignated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
	Federally Mandated	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
	Federally Mandated	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
3.2	Radiation															
	EPA	18	17	14	18	12	10	9	12	15	15	13	15	12	16	13
	Non-EPA Federal			242	215	148	165	230	223	209	193	215	201	212	228	353
	Total Radiation	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
	Federally Mandated	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
3.3	Total Air & Rad	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505
	Federally Mandated	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505

Footnotes to Table 3-3F

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2, plus amortized capital costs assuming an interest rate of ten percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Table 3-1 since 1972.

Table 3-3G: AIR POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	Non-EPA Federal	298	359	380	400	420	440	460	479	486	491	495	502	511	522	535
	State & Local Govt	1,101	1,133	1,142	1,178	1,211	1,241	1,249	1,250	1,246	1,241	1,225	1,199	1,172	1,132	1,077
	Private	18,514	19,616	19,781	20,236	21,166	21,842	21,920	21,795	21,662	21,474	21,343	21,241	21,145	20,994	20,831
	Total Existing Regs	19,912	21,108	21,303	21,814	22,797	23,523	23,629	23,524	23,394	23,206	23,063	22,942	22,828	22,648	22,442
	Federally Mandated	19,912	21,108	21,303	21,814	22,797	23,523	23,629	23,524	23,394	23,206	23,063	22,942	22,828	22,648	22,442
	New Regulations															
	Private		56	129	203	233	255	282	415	596	1,236	1,753	1,943	2,258	2,936	4,093
	Total New Regs		56	129	203	233	255	282	415	596	1,236	1,753	1,943	2,258	2,936	4,093
	Full Implementation								3,042	3,053	3,084	3,490	3,897	4,301	4,708	5,114
	Total Stationary	19,912	21,165	21,432	22,017	23,030	23,778	23,911	26,982	27,044	27,526	28,307	28,782	29,387	30,292	31,650
	Federally Mandated	19,912	21,165	21,432	22,017	23,030	23,778	23,911	26,982	27,044	27,526	28,307	28,782	29,387	30,292	31,650
3.1.2	Mobile Sources															
	Existing Regulations															
	Private	7,996	8,503	8,983	9,035	7,870	8,355	8,886	9,326	9,593	9,795	9,942	10,174	10,383	10,644	10,888
	Total Existing Regs	7,996	8,503	8,983	9,035	7,870	8,355	8,886	9,326	9,593	9,795	9,942	10,174	10,383	10,644	10,888
	Federally Mandated	7,996	8,503	8,983	9,035	7,870	8,355	8,886	9,326	9,593	9,795	9,942	10,174	10,383	10,644	10,888
	New Regulations															
	Private			16	165	181	446	580	559	540	1,217	1,932	2,649	3,349	3,350	3,355
	Total New Regs			16	165	181	446	580	559	540	1,217	1,932	2,649	3,349	3,350	3,355
	Full Implementation								1,326	1,345	1,505	1,522	1,537	1,553	1,568	1,440
	Total Mobile	7,996	8,503	8,998	9,201	8,051	8,801	9,465	11,211	11,479	12,517	13,396	14,359	15,285	15,562	15,683
	Federally Mandated	7,996	8,503	8,998	9,201	8,051	8,801	9,465	11,211	11,479	12,517	13,396	14,359	15,285	15,562	15,683
3.1.3	Undesignated Source															
	EPA	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
	Total Undesignated	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
	Federally Mandated	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	28,139	29,918	30,651	31,444	31,315	32,880	33,598	38,409	38,735	40,251	41,906	43,339	44,865	46,043	47,516
	Federally Mandated	28,139	29,918	30,651	31,444	31,315	32,880	33,598	38,409	38,735	40,251	41,906	43,339	44,865	46,043	47,516

Footnotes to Table 3-3G

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2A, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of ten years for mobile sources and 20 years for all other capital on the accumulated capital investment shown in Tables 3-1 and 3-1A since 1972.

Table 3-3H: RADIATION POLLUTION CONTROL COSTS BY FUNDING SOURCE ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	EPA	13	18	14	19	25	27	29	32	35	38	41	43	46	49	52
	Non-EPA Federal	353	321	347	374	402	430	459	488	518	549	580	612	644	674	706
	State Government															
	Local Government															
	Private															
	Total Exist Radiation	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
	Federally Mandated	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
	New Regulations															
	Local Government															
	Private	0	1	7	21	36	52	67	83	99	116	134	152	170	190	210
	Total New Regs	0	1	7	21	36	52	67	83	99	116	134	152	170	190	210
	Full Implementation															
	Total Radiation	366	340	368	414	463	509	555	603	653	703	755	807	861	913	967
	Federally Mandated	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
3.3	Total Air & Rad	28,505	30,258	31,019	31,858	31,778	33,389	34,153	39,013	39,387	40,954	42,660	44,146	45,726	46,956	48,483
	Federally Mandated	28,505	30,257	31,012	31,837	31,743	33,337	34,086	38,930	39,288	40,837	42,526	43,995	45,556	46,767	48,274

Footnotes to Table 3-3H

Sum of operating costs for year in question, shown on corresponding lines of Table 3-2B, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 25 years on the accumulated capital investment shown in Tables 3-1 and 3-1B since 1972.

Table 3-4: AIR AND RADIATION POLLUTION CONTROL CAPITAL COSTS BY POLLUTANT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Particulates	3,041	4,026	3,816	4,242	3,936	3,860	3,585	3,872	3,615	3,457	2,830	2,173	2,347	2,053	1,643
	Sulfur Oxides	1,134	1,502	1,557	1,642	1,395	1,139	979	1,012	1,067	989	1,516	1,185	830	432	538
	NOx and CO	147	195	206	221	222	230	286	310	400	361	288	255	158	172	193
	Hydrocarbons/VOCs	444	588	623	667	670	696	866	936	1,210	1,091	871	770	918	1,259	1,495
	Lead	28	38	53	39	41	41	42	44	40	38	42	40	47	170	153
	Hazardous	98	129	181	133	140	141	146	153	136	129	145	137	215	134	151
	Other	262	346	485	356	376	377	390	409	365	345	389	366	379	356	267
	Total Stationary	5,155	6,824	6,920	7,299	6,781	6,484	6,295	6,735	6,834	6,409	6,081	4,925	4,894	4,577	4,440
3.1.2	Mobile Sources															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	268	564	472	2,775	3,256	3,548	3,685	4,010	3,716	4,189	4,049	4,812	6,125	6,664	6,885
	Total Mobile	268	564	472	2,775	3,256	3,548	3,685	4,010	3,716	4,189	4,049	4,812	6,125	6,664	6,885
3.1.3	Undesignated Source															
3.1.4	Total Air Pollution	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
3.2	Radiation															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated			24	20	16	8	25	22	64	89	30	37	33	55	47
	Total Radiation			24	20	16	8	25	22	64	89	30	37	33	55	48
3.3	Total Air & Rad	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,373

Footnotes to Table 3-4

Air Stationary Sources: Total stationary source capital expenditures from Table 3-1 (Non-EPA Federal and Private) distributed across pollutants using factors in Appendix B, Table B-8.

Air Mobile Sources: Total mobile source capital expenditures from Table 3-1 (all Private). All mobile source capital expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible. Also see Appendix C, Table C-1.

Radiation: Total radiation capital expenditures from Table 3-1 (all Non-EPA Federal). All radiation capital expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

Table 3-4A: AIR POLLUTION CONTROL CAPITAL COSTS BY POLLUTANT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	Particulates	1,643	1,920	1,845	1,792	1,739	1,687	1,634	1,581	1,529	1,476	1,423	1,371	1,318	1,265	1,213
	Sulfur Oxides	538	570	548	532	516	501	485	469	454	438	423	407	391	376	360
	NOx and CO	193	168	161	157	152	147	143	138	134	129	124	120	115	111	106
	Hydrocarbons/VOCs	1,495	1,183	1,136	1,104	1,071	1,039	1,007	974	942	909	877	844	812	779	747
	Lead	153	120	115	112	109	105	102	99	96	92	89	86	82	79	76
	Hazardous	151	159	152	148	144	139	135	131	126	122	118	113	109	105	100
	Other	267	319	306	297	289	280	271	262	254	245	236	227	219	210	201
	Total Existing Regs	4,440	4,438	4,264	4,142	4,020	3,898	3,777	3,655	3,533	3,411	3,290	3,168	3,046	2,924	2,803
	New Regulations															
	Particulates		477	477	477											
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead					106	106	106								
	Hazardous															
	Other															
	Total New Regs		477	477	477	106	106	106								
	Total Stationary	4,440	4,915	4,741	4,619	4,126	4,004	3,883	3,655	3,533	3,411	3,290	3,168	3,046	2,924	2,803
3.1.2	Mobile Sources															
	Existing Regulations															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	6,885	6,653	6,788	6,476	6,566	6,729	6,871	7,066	7,217	7,367	7,468	7,623	7,732	7,844	7,956
	Total Existing Regs	6,885	6,653	6,788	6,476	6,566	6,729	6,871	7,066	7,217	7,367	7,468	7,623	7,732	7,844	7,956
	New Regulations															
	Particulates			5	5	5	40	41	43	69	71	73	75	77	80	82
	Sulfur Oxides															
	NOx and CO			91	92	92	106	110	113	117	120	124	128	132	136	141
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated															
	Total New Regs			96	97	97	147	151	156	186	191	197	203	210	216	223
	Total Mobile	6,885	6,653	6,883	6,573	6,663	6,876	7,022	7,222	7,403	7,559	7,665	7,827	7,941	8,061	8,179
3.1.3	Undesignated Source															
3.1.4	Total Air Pollution	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981

Footnotes to Table 3-4A

Existing Stationary Sources: Total existing stationary source capital expenditures from Table 3-1A (Non-EPA Federal and Private) distributed across pollutants using factors in Appendix B, Table B-8.

New Stationary Sources: Total new stationary source capital expenditures from Table 3-1A (all Private) distributed across pollutants using factors in Appendix B, Table B-8.

Existing Mobile Sources: Data are total existing mobile source capital expenditures from Table 3-1A (all Private). Also see Appendix C, Table C-1A. All mobile source capital expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

New Mobile Sources: Data are total new mobile source capital expenditures from Table 3-1A (all Private). Also see Appendix C, Table C-1A. All mobile source capital expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

Table 3-4B: RADIATION POLLUTION CONTROL CAPITAL COSTS BY POLLUTANT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
	Total Existing Regs	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
	New Regulations															
	Radon	1	4	34	79	79	94	89	93	98	103	107	112	117	122	127
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated															
	Total New Regs	1	4	34	79	79	94	89	93	98	103	107	112	117	122	127
	Total Radiation	48	60	90	145	151	171	171	180	190	201	210	220	230	240	251
3.3	Total Air & Rad	11,373	11,628	11,714	11,337	10,940	11,051	11,076	11,057	11,126	11,171	11,165	11,215	11,218	11,225	11,232

Footnotes to Table 3-4B

Existing Radiation: Total existing radiation capital expenditures from Table 3-1B (all Non-EPA Federal). All radiation capital expenditures for existing regulations are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

New Radiation: Estimated expenditures for radon control from Appendix D, Table D-1.

Table 3-5: AIR AND RADIATION POLLUTION CONTROL OPERATING COSTS BY POLLUTANT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Particulates	3,389	3,452	3,078	3,345	3,770	4,306	4,467	4,578	4,073	4,046	3,296	3,493	3,996	3,876	3,427
	Sulfur Oxides	1,264	1,287	1,256	1,295	1,336	1,271	1,221	1,196	1,202	1,157	1,766	1,904	1,414	816	1,122
	NOx and CO	164	167	166	174	212	257	357	366	451	422	335	409	269	324	403
	Hydrocarbons/VOCs	495	504	503	526	642	777	1,079	1,107	1,363	1,277	1,014	1,238	1,564	2,377	3,120
	Lead	32	32	43	31	39	46	53	53	45	44	49	64	80	321	319
	Hazardous	109	111	146	105	134	157	182	181	154	151	169	220	366	254	315
	Other	291	297	391	281	360	420	487	484	411	403	453	588	646	672	557
	Total Stationary	5,744	5,850	5,583	5,756	6,494	7,234	7,845	7,965	7,698	7,501	7,083	7,915	8,335	8,639	9,264
3.1.2	Mobile Sources															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	1,307	2,118	2,082	1,828	1,597	1,494	1,293	1,027	836	443	192	269	114	(3)	236
	Total Mobile	1,307	2,118	2,082	1,828	1,597	1,494	1,293	1,027	836	443	192	269	114	(3)	236
3.1.3	Undesignated Source	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
3.2	Radiation															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
	Total Radiation	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
3.3	Total Air & Rad	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045

Footnotes to Table 3-5

Air Stationary Sources: Total stationary source operating expenditures from Table 3-2 (EPA, Non-EPA Federal, and Private) distributed across pollutants using factors in Appendix B, Table B-8.

Air Mobile Sources: Total mobile source operating expenditures from Table 3-2 (EPA and Private). Also see Appendix C, Table C-1.

Undesignated Source: Total undesignated source operating expenditures from Table 3-2 (EPA, State and Local Government).

Radiation: Total radiation operating expenditures from Table 3-2 (EPA and Non-EPA Federal). All radiation operating expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

Table 3-5A: AIR POLLUTION CONTROL OPERATING COSTS BY POLLUTANT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	Particulates	3,427	4,300	4,168	4,179	4,400	4,515	4,631	4,747	4,863	4,979	5,095	5,211	5,327	5,442	5,558
	Sulfur Oxides	1,122	1,277	1,237	1,240	1,306	1,340	1,375	1,409	1,444	1,478	1,512	1,547	1,581	1,616	1,650
	NOx and CO	403	376	364	365	384	394	404	415	425	435	445	455	465	475	485
	Hydrocarbons/VOCs	3,120	2,649	2,567	2,574	2,710	2,781	2,853	2,924	2,995	3,067	3,138	3,210	3,281	3,352	3,424
	Lead	319	269	261	261	275	282	290	297	304	311	319	326	333	340	348
	Hazardous	315	355	344	345	364	373	383	392	402	412	421	431	440	450	459
	Other	557	713	691	693	730	749	768	787	807	826	845	864	884	903	922
	Total Existing Regs	9,264	9,939	9,632	9,657	10,168	10,436	10,704	10,972	11,239	11,507	11,775	12,043	12,311	12,579	12,846
	New Regulations															
	Particulates			17	35	52	52	52	52	52	52	52	52	52	52	52
	Sulfur Oxides										327	654	654	654	654	1,308
	NOx and CO															
	Hydrocarbons/VOCs							5	5	63	66	70	74	79	448	641
	Lead						10	20	29	29	29	29	29	29	29	29
	Hazardous								124	247	557	743	929	1,239	1,548	1,858
	Other															
	Total New Regs			17	35	52	62	77	210	391	1,031	1,548	1,738	2,053	2,731	3,888
	Total Stationary	9,264	9,939	9,649	9,692	10,220	10,498	10,781	11,182	11,630	12,538	13,323	13,781	14,364	15,310	16,734
3.1.2	Mobile Sources															
	Existing Regulations															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	236	238	213	(136)	(1,766)	(1,694)	(1,623)	(1,549)	(1,459)	(1,372)	(1,320)	(1,246)	(1,191)	(1,153)	(1,135)
	Total Existing Regs	236	238	213	(136)	(1,766)	(1,694)	(1,623)	(1,549)	(1,459)	(1,372)	(1,320)	(1,246)	(1,191)	(1,153)	(1,135)
	New Regulations															
	Particulates						241	484	438	389	335	318	301	283	265	249
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs				134	134	134									
	Lead															
	Other															
	Undesignated										700	1,400	2,100	2,800	2,800	2,800
	Total New Regs				134	134	375	484	438	389	1,035	1,718	2,401	3,083	3,065	3,049
	Total Mobile	236	238	213	(2)	(1,632)	(1,319)	(1,139)	(1,111)	(1,070)	(337)	398	1,155	1,892	1,912	1,914
3.1.3	Undesignated Source	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	9,731	10,427	10,083	9,916	8,823	9,480	9,863	10,287	10,772	12,408	13,923	15,134	16,449	17,410	18,832

Footnotes to Table 3-5A

Existing Stationary Sources: Total stationary source operating expenditures from Table 3-2A (EPA, Non-EPA Federal, and Private) distributed across pollutants using factors in Appendix B, Table B-8.

New Stationary Sources: Total stationary source operating expenditures from Table 3-2A (all Private) distributed across pollutants using factors in Appendix B, Table B-8.

Existing Mobile Sources: Data are total mobile source operating expenditures from Table 3-2A (EPA and Private). Also see Appendix C, Table C-1A. All mobile source operating expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

New Mobile Sources: Data are total mobile source operating expenditures from Table 3-2A (all Private). Also see Appendix C, Table C-1A. All mobile source operating expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

Table 3-5B: RADIATION POLLUTION CONTROL OPERATING COSTS BY POLLUTANT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
	Total Existing Regs	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
	New Regulations															
	Radon	0	0	3	8	14	20	25	31	36	42	48	53	59	65	71
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated															
	Total New Regs	0	0	3	8	14	20	25	31	36	42	48	53	59	65	71
	Total Radiation	314	281	300	330	362	389	417	445	473	502	530	558	587	615	644
3.3	Total Air & Rad	10,045	10,708	10,383	10,246	9,185	9,869	10,280	10,732	11,245	12,910	14,453	15,692	17,035	18,025	19,476

Footnotes to Table 3-5B

Existing Radiation: Total existing radiation operating expenditures from Table 3-2B (EPA and Non-EPA Federal). All radiation operating expenditures are included as undesignated (i.e., undesignated among pollutants) because a distinction by pollutant has not been possible.

New Radiation: Estimated expenditures for radon control from Appendix D, Table D-1.

Table 3-6: AIR POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Particulates	3,676	4,119	4,105	4,773	5,569	6,469	6,969	7,446	7,281	7,581	7,098	7,500	8,225	8,298	8,005
	Sulfur Oxides	1,371	1,536	1,651	1,846	2,019	2,061	2,103	2,174	2,281	2,329	3,081	3,331	2,920	2,362	2,719
	NOx and CO	178	199	218	247	306	372	499	537	660	665	606	704	579	650	747
	Hydrocarbons/VOCs	537	602	659	746	925	1,125	1,510	1,626	1,995	2,012	1,832	2,128	2,541	3,473	4,357
	Lead	34	39	54	45	58	68	80	83	79	82	91	110	130	387	400
	Hazardous	118	132	185	156	199	235	273	286	272	282	314	377	544	444	520
	Other	316	354	494	417	532	628	731	767	729	754	839	1,009	1,103	1,162	1,073
	Total Stationary	6,230	6,981	7,366	8,229	9,607	10,959	12,164	12,920	13,298	13,706	13,862	15,159	16,041	16,777	17,821
3.1.2	Mobile Sources															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	1,345	2,236	2,268	2,409	2,642	3,043	3,367	3,672	4,010	4,213	4,501	5,182	5,832	6,269	7,025
	Total Mobile	1,345	2,236	2,268	2,409	2,642	3,043	3,367	3,672	4,010	4,213	4,501	5,182	5,832	6,269	7,025
3.1.3	Undesignated Source	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
3.2	Radiation															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated	18	17	255	232	158	173	237	232	219	201	220	207	215	233	354
	Total Radiation	18	17	255	232	158	173	237	232	219	201	220	207	215	233	355
3.3	Total Air & Rad	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431

Footnotes to Table 3-6

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5, plus amortized capital costs assuming an interest rate of seven percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Table 3-4 since 1972.

Table 3-6A: AIR POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	Particulates	8,005	9,059	9,101	9,281	9,666	9,941	9,924	9,809	9,709	9,564	9,443	9,324	9,226	9,095	8,985
	Sulfur Oxides	2,719	2,927	2,940	2,993	3,107	3,189	3,162	3,099	3,029	2,950	2,893	2,858	2,837	2,811	2,779
	NOx and CO	747	735	739	755	788	812	822	827	830	831	832	832	826	817	800
	Hydrocarbons/VOCs	4,357	3,998	4,023	4,134	4,371	4,541	4,665	4,773	4,874	4,969	5,060	5,145	5,211	5,268	5,295
	Lead	400	361	364	375	399	416	430	443	455	467	479	490	501	512	522
	Hazardous	520	575	579	593	625	648	661	671	675	684	691	698	704	709	715
	Other	1,073	1,259	1,266	1,296	1,360	1,406	1,426	1,437	1,434	1,443	1,449	1,454	1,457	1,458	1,461
	Total Existing Regs	17,821	18,915	19,011	19,427	20,317	20,953	21,091	21,059	21,007	20,908	20,847	20,801	20,762	20,671	20,558
	New Regulations															
	Particulates		45	107	170	187	187	187	187	187	187	187	187	187	187	187
	Sulfur Oxides										327	654	654	654	654	1,308
	NOx and CO															
	Hydrocarbons/VOCs							5	5	63	66	70	74	79	448	641
	Lead					10	30	50	59	59	59	59	59	59	59	59
	Hazardous								124	247	557	743	929	1,239	1,548	1,858
	Other															
	Total New Regs		45	107	170	197	217	242	375	556	1,196	1,713	1,903	2,218	2,896	4,053
	Total Stationary	17,821	18,960	19,118	19,597	20,514	21,170	21,333	21,434	21,563	22,104	22,560	22,704	22,981	23,567	24,611
3.1.2	Mobile Sources															
	Existing Regulations															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	7,025	7,469	7,885	7,888	6,664	7,098	7,570	7,965	8,210	8,397	8,532	8,745	8,934	9,167	9,383
	Total Existing Regs	7,025	7,469	7,885	7,888	6,664	7,098	7,570	7,965	8,210	8,397	8,532	8,745	8,934	9,167	9,383
	New Regulations															
	Particulates			1	1	2	249	498	458	419	375	368	362	354	347	342
	Sulfur Oxides															
	NOx and CO			13	26	39	54	70	86	103	120	137	156	162	168	175
	Hydrocarbons/VOCs				134	134	134									
	Lead															
	Other															
	Undesignated										700	1,400	2,100	2,800	2,800	2,800
	Total New Regs			14	161	175	437	568	544	521	1,195	1,906	2,618	3,316	3,315	3,317
	Total Mobile	7,025	7,469	7,899	8,049	6,839	7,535	8,138	8,509	8,731	9,592	10,438	11,362	12,250	12,482	12,700
3.1.3	Undesignated Source	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	25,077	26,679	27,238	27,872	27,588	29,005	29,692	30,160	30,507	31,904	33,200	34,265	35,424	36,237	37,495

Footnotes to Table 3-6A

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5, plus amortized capital costs assuming an interest rate of seven percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Tables 3-4 and 3-4A since 1972.

Table 3-6B: RADIATION POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated	354	326	347	377	410	438	467	497	528	559	590	622	654	685	717
	Total Existing Regs	354	326	347	377	410	438	467	497	528	559	590	622	654	685	717
	New Regulations															
	Radon	0	1	6	19	31	45	58	71	85	100	115	130	146	162	179
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated															
	Total New Regs	0	1	6	19	31	45	58	71	85	100	115	130	146	162	179
	Total Radiation	355	327	353	396	441	483	525	568	613	659	705	752	800	847	896
3.3	Total Air & Rad	25,431	27,006	27,591	28,267	28,029	29,488	30,217	30,728	31,120	32,562	33,905	35,017	36,224	37,085	38,390

Footnotes to Table 3-6B

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5B, plus amortized capital costs assuming an interest rate of seven percent and a capital life of 25 years on the accumulated capital investment shown in Tables 3-4 and 3-4B since 1972.

Table 3-6C: AIR & RADIATION POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Particulates	3,594	3,927	3,810	4,362	5,051	5,847	6,249	6,620	6,358	6,564	6,004	6,347	7,007	7,025	6,687
	Sulfur Oxides	1,340	1,464	1,537	1,687	1,822	1,833	1,849	1,893	1,970	1,992	2,703	2,920	2,486	1,917	2,260
	NOx and CO	174	190	203	226	279	339	458	488	599	595	528	619	490	556	648
	Hydrocarbons/VOCs	525	574	614	682	843	1,025	1,386	1,476	1,813	1,800	1,597	1,872	2,260	3,157	4,001
	Lead	34	37	51	41	52	62	72	75	69	71	79	97	115	368	377
	Hazardous	115	126	173	141	180	212	247	256	238	244	272	332	492	389	461
	Other	309	338	464	378	483	568	661	685	638	653	728	888	971	1,021	924
	Total Stationary	6,090	6,655	6,853	7,517	8,711	9,886	10,921	11,493	11,686	11,919	11,910	13,074	13,822	14,434	15,357
3.1.2	Mobile Sources															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	1,338	2,215	2,235	2,306	2,457	2,769	3,000	3,205	3,450	3,547	3,740	4,315	4,822	5,161	5,825
	Total Mobile	1,338	2,215	2,235	2,306	2,457	2,769	3,000	3,205	3,450	3,547	3,740	4,315	4,822	5,161	5,825
3.1.3	Undesignated Source	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
3.2	Radiation															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
	Total Radiation	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
3.3	Total Air & Rad	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755

Footnotes to Table 3-6C

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5, plus amortized capital costs assuming an interest rate of three percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Table 3-4 since 1972.

Table 3-6D: AIR POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	Particulates	6,687	7,689	7,681	7,812	8,150	8,379	8,400	8,352	8,314	8,244	8,191	8,139	8,103	8,044	7,998
	Sulfur Oxides	2,260	2,452	2,449	2,488	2,589	2,657	2,648	2,613	2,573	2,526	2,495	2,480	2,475	2,467	2,454
	NOx and CO	648	632	631	642	672	692	702	708	713	717	721	723	722	719	709
	Hydrocarbons/VOCs	4,001	3,609	3,604	3,685	3,893	4,034	4,143	4,241	4,333	4,421	4,506	4,588	4,655	4,716	4,757
	Lead	377	335	334	342	363	378	390	401	411	422	433	443	453	462	472
	Hazardous	461	512	511	522	550	569	581	591	597	605	613	621	628	635	642
	Other	924	1,102	1,101	1,122	1,179	1,217	1,236	1,250	1,254	1,265	1,275	1,284	1,292	1,298	1,306
	Total Existing Regs	15,357	16,331	16,311	16,614	17,395	17,925	18,100	18,155	18,195	18,202	18,235	18,280	18,329	18,341	18,338
	New Regulations															
	Particulates		32	81	131	148	148	148	148	148	148	148	148	148	148	148
	Sulfur Oxides										327	654	654	654	654	1,308
	NOx and CO															
	Hydrocarbons/VOCs							5	5	63	66	70	74	79	448	641
	Lead					7	24	41	50	50	50	50	50	50	50	50
	Hazardous								124	247	557	743	929	1,239	1,548	1,858
	Other															
	Total New Regs		32	81	131	155	172	195	328	509	1,149	1,666	1,856	2,171	2,849	4,006
	Total Stationary	15,357	16,363	16,392	16,745	17,550	18,097	18,295	18,482	18,704	19,350	19,900	20,135	20,500	21,189	22,343
3.1.2	Mobile Sources															
	Existing Regulations															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	5,825	6,192	6,530	6,470	5,175	5,545	5,947	6,284	6,502	6,672	6,792	6,980	7,146	7,345	7,525
	Total Existing Regs	5,825	6,192	6,530	6,470	5,175	5,545	5,947	6,284	6,502	6,672	6,792	6,980	7,146	7,345	7,525
	New Regulations															
	Particulates			1	1	2	247	495	454	413	368	359	351	342	332	325
	Sulfur Oxides															
	NOx and CO			11	21	32	45	58	71	84	99	113	128	133	138	144
	Hydrocarbons/VOCs				134	134	134									
	Lead															
	Other															
	Undesignated										700	1,400	2,100	2,800	2,800	2,800
	Total New Regs			11	157	168	426	553	525	498	1,166	1,872	2,579	3,275	3,271	3,269
	Total Mobile	5,825	6,192	6,541	6,627	5,343	5,971	6,500	6,810	7,000	7,838	8,664	9,559	10,421	10,615	10,795
3.1.3	Undesignated Source	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	21,414	22,804	23,154	23,598	23,128	24,369	25,016	25,509	25,916	27,396	28,767	29,892	31,113	31,993	33,322

Footnotes to Table 3-6D

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5A, plus amortized capital costs assuming an interest rate of three percent and a capital life of ten years for mobile sources and 20 years for all other capital on the accumulated capital investment shown in Table 3-4 and 3-4A since 1972.

Table 3-6E: RADIATION POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
	Total Existing Regs	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
	New Regulations															
	Radon	0	1	5	15	25	36	47	58	69	81	93	105	117	130	143
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated															
	Total New Regs	0	1	5	15	25	36	47	58	69	81	93	105	117	130	143
	Total Radiation	341	312	335	374	415	452	489	528	567	607	647	688	730	770	812
3.3	Total Air & Rad	21,755	23,116	23,490	23,972	23,543	24,821	25,505	26,036	26,483	28,002	29,414	30,580	31,843	32,764	34,134

Footnotes to Table 3-6E

Existing Radiation: Sum of operating costs for year in question, shown on corresponding lines of Table 3-5B, plus amortized capital costs assuming an interest rate of three percent and a capital life of 25 years on the accumulated capital investment shown in Tables 3-4 and 3-4B since 1972.

Table 3-6F: AIR POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Particulates	3,746	4,282	4,356	5,122	6,009	6,998	7,580	8,147	8,066	8,445	8,027	8,480	9,258	9,379	9,124
	Sulfur Oxides	1,397	1,597	1,748	1,980	2,185	2,254	2,319	2,413	2,544	2,616	3,403	3,680	3,288	2,740	3,110
	NOx and CO	181	207	231	264	329	400	534	579	711	725	672	776	654	730	831
	Hydrocarbons/VOCs	547	626	697	799	994	1,210	1,615	1,752	2,150	2,192	2,032	2,346	2,780	3,740	4,660
	Lead	35	40	56	49	62	74	86	91	88	91	102	121	142	404	420
	Hazardous	120	138	194	168	214	254	295	312	301	314	349	416	587	490	570
	Other	322	368	519	451	574	679	791	836	807	839	934	1,112	1,215	1,282	1,199
	Total Stationary	6,349	7,257	7,802	8,834	10,367	11,869	13,220	14,131	14,667	15,222	15,518	16,929	17,924	18,765	19,912
3.1.2	Mobile Sources															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	1,350	2,253	2,295	2,492	2,791	3,265	3,663	4,051	4,464	4,752	5,117	5,885	6,650	7,166	7,996
	Total Mobile	1,350	2,253	2,295	2,492	2,791	3,265	3,663	4,051	4,464	4,752	5,117	5,885	6,650	7,166	7,996
3.1.3	Undesignated Source	341	364	292	286	279	285	230	310	327	278	261	231	237	233	231
3.1.4	Total Air Pollution	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
3.2	Radiation															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
	Total Radiation	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
3.3	Total Air & Rad	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505

Footnotes to Table 3-6F

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5, plus amortized capital costs assuming an interest rate of ten percent and a capital life of ten years for mobile sources, 25 years for radiation, and 20 years for all other capital on the accumulated capital investment shown in Table 3-4 since 1972.

Table 3-6G: AIR POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	Existing Regulations															
	Particulates	9,124	10,222	10,306	10,528	10,953	11,267	11,218	11,046	10,893	10,685	10,505	10,329	10,178	9,988	9,822
	Sulfur Oxides	3,110	3,331	3,356	3,421	3,548	3,641	3,599	3,512	3,417	3,310	3,230	3,178	3,144	3,103	3,055
	NOx and CO	831	823	830	850	887	914	924	927	929	928	927	924	914	901	876
	Hydrocarbons/VOCs	4,660	4,327	4,379	4,515	4,777	4,971	5,108	5,225	5,334	5,433	5,529	5,618	5,683	5,736	5,753
	Lead	420	384	389	403	429	449	465	479	491	505	518	530	542	554	565
	Hazardous	570	629	636	654	689	715	729	739	742	750	757	764	769	773	778
	Other	1,199	1,393	1,407	1,443	1,514	1,566	1,586	1,596	1,588	1,594	1,597	1,599	1,598	1,593	1,593
	Total Existing Regs	19,912	21,108	21,303	21,814	22,797	23,523	23,629	23,524	23,394	23,206	23,063	22,942	22,828	22,648	22,442
	New Regulations															
	Particulates		56	129	203	220	220	220	220	220	220	220	220	220	220	220
	Sulfur Oxides										327	654	654	654	654	1,308
	NOx and CO															
	Hydrocarbons/VOCs							5	5	63	66	70	74	79	448	641
	Lead					12	35	57	66	66	66	66	66	66	66	66
	Hazardous								124	247	557	743	929	1,239	1,548	1,858
	Other															
	Total New Regs		56	129	203	233	255	282	415	596	1,236	1,753	1,943	2,258	2,936	4,093
	Total Stationary	19,912	21,165	21,432	22,017	23,030	23,778	23,911	23,940	23,991	24,442	24,817	24,885	25,086	25,584	26,536
3.1.2	Mobile Sources															
	Existing Regulations															
	Particulates															
	Sulfur Oxides															
	NOx and CO															
	Hydrocarbons/VOCs															
	Lead															
	Other															
	Undesignated	7,996	8,503	8,983	9,035	7,870	8,355	8,886	9,326	9,593	9,795	9,942	10,174	10,383	10,644	10,888
	Total Existing Regs	7,996	8,503	8,983	9,035	7,870	8,355	8,886	9,326	9,593	9,795	9,942	10,174	10,383	10,644	10,888
	New Regulations															
	Particulates			1	2	2	250	500	461	423	380	375	371	364	359	355
	Sulfur Oxides															
	NOx and CO			15	30	45	62	80	98	117	137	157	178	185	192	200
	Hydrocarbons/VOCs				134	134	134									
	Lead															
	Other															
	Undesignated										700	1,400	2,100	2,800	2,800	2,800
	Total New Regs			16	165	181	446	580	559	540	1,217	1,932	2,649	3,349	3,350	3,355
	Total Mobile	7,996	8,503	8,998	9,201	8,051	8,801	9,465	9,885	10,134	11,012	11,874	12,822	13,732	13,994	14,243
3.1.3	Undesignated Source	231	250	221	226	235	301	221	217	212	207	203	198	193	189	184
3.1.4	Total Air Pollution	28,139	29,918	30,651	31,444	31,315	32,880	33,598	34,041	34,337	35,662	36,894	37,905	39,011	39,767	40,962

Footnotes to Table 3-6G

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5A, plus amortized capital costs assuming an interest rate of ten percent and a capital life of ten years for mobile sources and 20 years for all other capital on the accumulated capital investment shown in Tables 3-4 and 3-4A since 1972.

Table 3-6H: RADIATION POLLUTION CONTROL COSTS BY POLLUTANT ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.2	Radiation															
	Existing Regulations															
	Radon															
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
	Total Existing Regs	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
	New Regulations															
	Radon	0	1	7	21	36	52	67	83	99	116	134	152	170	190	210
	High Lev Nucl Waste															
	Low Lev Nucl Waste															
	Nucl Fuel Cycl Rsk															
	Radiofrqcy Radiatn															
	Uranium Mill Tailg															
	Undesignated															
	Total New Regs	0	1	7	21	36	52	67	83	99	116	134	152	170	190	210
	Total Radiation	366	340	368	414	463	509	555	603	653	703	755	807	861	913	967
3.3	Total Air & Rad	28,505	30,258	31,019	31,858	31,778	33,389	34,153	34,645	34,989	36,365	37,648	38,712	39,872	40,680	41,929

Footnotes to Table 3-6H

Sum of operating costs for year in question, shown on corresponding lines of Table 3-5B, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 25 years on the accumulated capital investment shown in Tables 3-4 and 3-4B since 1972.

4. COSTS OF WATER POLLUTION CONTROL

The costs of water pollution control are broken down into several categories and discussed in the sections listed below:

4.1. Water quality;
4.1.1. Point source;
4.1.2. Non-point source;
4.1.3. Groundwater protection;
4.2. Total water quality;
4.3. Drinking water; and
4.4. Total water pollution control costs.

The costs reported in this chapter are for existing water programs and new regulations for which cost information is available. New regulations for which cost information is not available, and pending legislation that would augment current water pollution control efforts, are noted in the appropriate sections. Efforts directed to groundwater pollution control are discussed in section 4.1.3. However, the costs of these efforts are for the most part listed and discussed in other chapters of this report.

Estimates of the capital costs of water pollution control are presented in Table 4-1. Table 4-2 presents estimates of operating costs, and Table 4-3 presents estimates of annualized costs calculated using capital amortization rates of three, seven, and ten percent. Annualized costs for all water pollution control programs except drinking water are based on a 30-year capital life. Annualized costs for the drinking water program are based on a 20-year capital life.

The discussion of water costs that follows focuses on the annualized cost estimates calculated using an amortization rate of seven percent for capital costs. Annualized costs calculated at a three percent rate are approximately 16 to 19 percent lower, and those calculated at the ten percent rate are 13 to 16 percent higher, than the annualized cost estimates discussed below.

4.1. WATER QUALITY

Water quality costs are defined as those pursuant to the Marine Protection, Sanctuaries and Research Act of 1972, and the Clean Water Act (CWA) as last amended in 1987.[1] They represent expenditures intended to improve the quality of the Nation's natural waters, including expenditures for wastewater treatment as well as those incurred in transporting wastewater from its point of origin to treatment facilities. Also included under water quality costs are "full implementation" costs which represent the projected additional expenditures needed to meet secondary treatment requirements for municipal wastewater by the year 2000, beyond what is projected to be spent by Federal, state and local governments for this purpose throughout the 1990s.

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[1] Legislation has been introduced which would strengthen the water quality standards program for coastal waters. EPA has estimated that the House version (HR 2647, "Coastal Defense Initiative") would require expenditures of $124 million by EPA and states in FY 1991, increasing to $158 million for FY 1993. These costs are not included in the tables.

Water pollution control costs are broken down by "point" and "non-point" sources. Non-point source expenditures are those incurred to control pollution from sources other than single, specific locations. Non-point sources include land runoff, precipitation, drainage, and seepage, including agricultural storm drainage, and irrigation return flows. The costs of controlling point and non-point sources of water pollution by each sector are initially discussed separately.

The EPA and other Federal agencies such as the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and National Marine Fisheries Service, as well as states also incur costs for habitat protection, which involves both point and non-point source control. EPA and state expenditures for habitat protection cannot be readily broken out from other water quality costs, however. Non-EPA Federal costs for habitat protection are not included in the data base.

4.1.1. Point Source

4.1.1.1. EPA

EPA expenditures prior to 1977 were associated primarily with program development for the regulation of conventional pollutants, including: establishing water quality standards; developing a permit program for pollutant discharge; and setting effluent limitations for various industrial discharges. Under authority of the CWA and the Marine Protection, Research and Sanctuaries Act, EPA also established regulations for ocean disposal of wastes.

In recent years EPA expenditures have been primarily for oversight and guidance of regulatory implementation by the states. EPA costs, on an annualized basis, decreased throughout the 1980s except for a slight increase after the 1987 Amendments to the CWA. Among other things, the 1987 Amendments directed EPA to develop and maintain adequate controls for toxic discharges.

EPA expenditures for regulatory development, implementation, and oversight are provided in Table 4-2. Future EPA implementation costs may increase beyond the projections given in this report because of the potential for revisions in effluent limitation guidelines resulting from the new review process mandated under Section 304(m) of the CWA Amendments.

EPA capital expenditures, shown in Table 4-1, are for municipal wastewater treatment under the Construction Grants Program,[2] which provides matching funds to localities to build publicly-owned wastewater treatment plants. EPA construction grants increased dramatically after the passage of the CWA in 1972, increasing from $1.6 billion in 1973 to $6.2 billion in

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[2] Includes spending pursuant to the CWA Construction Grants Program (Title II) and the 1987 CWA Amendments State Revolving Fund Program (Title VI).

1977. EPA expenditures fell off somewhat over the next few years and have declined steadily since 1981. The lower levels of Federal construction grants since 1977 reflect the 1977 CWA Amendments that provided for delegation of water quality management to the states.

Before 1985, EPA paid 75 percent of the eligible capital cost of conventional treatment facilities; local governments, some with state assistance, paid the remainder. In 1985, the Federal share was cut to 55 percent. By 1988, Federal assistance had fallen to about $2.3 billion. Beginning in 1988, Federal assistance will be shifted to the capitalization of 50 state revolving funds (SRFs) at a substantially reduced level of funding. Federal assistance will decrease steadily to about $434 million in 1994 and zero thereafter.

4.1.1.2. State and Local Government

State expenditures support program implementation and administration of the National Pollutant Discharge Elimination System (NPDES) permit program to control discharges of water pollutants. Expenditures increased steadily throughout the 1980s as states assumed greater responsibility for implementation and enforcement of the regulations. As a result of the 1987 CWA Amendments, states are now working towards meeting water quality objectives involving toxic discharges. Other state water quality expenditures are for the Great Lakes, Chesapeake Bay and other estuary clean-up programs. While states have received considerable Federal assistance for some of these efforts, many are financed through state legislative appropriations. The cost projections do not necessarily reflect state and local expenditures to develop and implement state water quality standards established in addition to Federal effluent guidelines.

Federal grants are a small source of state spending for implementation of water quality programs. Between 1981 and 1987, they averaged 6.4 percent of total state operating and maintenance expenditures, falling to 4.9 percent in 1988. Currently, states set aside a small portion of construction grants to fund water quality planning and management. As Federal assistance is phased out, states will have to find other funding sources for these activities.

As mentioned above, the 1987 amendments to the CWA shifted Federal funds for municipal wastewater treatment facility construction from local communities to states. EPA grants to communities have been replaced by grants to states for the purpose of capitalizing SRFs over the years 1989-94. States must match Federal grants by 20 percent on the dollar. The SRFs will enable states to provide financial assistance to local governments in the form of low interest loans, loan refinancing, and loan guarantees. Federal grants to SRFs for wastewater treatment construction are not authorized beyond 1994.

Local government expenditures cover a large portion of total construction costs and all the operation and maintenance costs of municipal wastewater treatment facilities. About 100 municipalities contract with the private sector for the operation of wastewater treatment facilities. Most of these facilities are relatively small (less than ten million gallons per day) with limited technical resources and finances.[3] Annualized local government costs for all wastewater services, including sewerage and wastewater treatment, increased from a little over $3 billion in 1972 to $10.1 billion in 1987. Local annual costs are projected to increase significantly throughout the 1990s, reaching an estimated $16.5 billion by the year 2000.

The cost category labeled "full implementation" in Tables 4-1, 4-2, and 4-3 provides data on the amount of expenditures for wastewater treatment required to bring municipal wastewater treatment into full compliance with the fishable/swimmable goals of the Clean Water Act. These estimates represent costs beyond what local governments are expected to spend on wastewater treatment over the years 1990-2000. The annualized costs required to meet wastewater treatment needs above projected expenditures for this purpose are estimated to increase steadily from $300 million in 1990 to about $2.8 billion by 1995, and to almost $6 billion by the year 2000. (The derivation of these full implementation costs is detailed in Appendix A.)

4.1.1.3. Private

Private water quality expenditures are associated mainly with the control of industrial effluents in compliance with NPDES permits, and for the pretreatment of discharges to municipal wastewater treatment facilities. Water quality costs to the private sector, on an annualized basis, increased from about $3.9 billion in 1972 to almost $16 billion in 1987. Future private water quality costs are projected to continue this trend, reaching $23 billion by the year 2000. The estimates of private costs for new regulations ($565 million in the year 2000) do not include the costs of complying with new requirements for the control of toxic discharges and expanded pretreatment requirements that are expected to be implemented within the next few years.

4.1.2. Non-point Source

For purposes of this report, non-point source costs include public and private expenditures for water quality related conservation practices, highway erosion control, feedlot operations, and stormwater runoff. These costs are a very small component of current and projected future total water pollution control costs, but may eventually escalate well beyond the projections shown in the tables. This result is possible because non-point sources currently are the largest contributor to the water pollution problem and additional measures to control these sources may be initiated within the next few years.

4.1.2.1. EPA

Due to lack of data, no estimates of EPA expenditures directed to non-point source pollution control are provided.

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[3] Apogee Research, Inc., *The Nation's Public Works: Report of Wastewater Management*, prepared for the National Council on Public Works Improvements, May 1987.

4.1.2.2. Non-EPA Federal

The non-EPA Federal costs shown in Table 4-1 are primarily for U.S. Department of Agriculture (USDA) programs involving construction and maintenance of erosion control structures. These programs, which are implemented through the Soil and Conservation Service and the Agricultural Stabilization and Conservation Service, provide capital grants to help finance erosion control practices, provide research funding for the development of new control technologies and best management practices designed to reduce erosion rates on farmland, and provide technical assistance to farmers implementing erosion control measures.

Rather than attribute all costs for erosion control practices to non-point source water pollution control in this report, information from the USDA on the proportion of their program costs targeted explicitly for water quality programs in 1986, the only year for which this data was broken out, was used to calculate the share of erosion control costs directed to water pollution control in years 1972-1986. The resulting estimates show that total capital costs for non-point source control have remained fairly stable since 1972, at around $70 million per year. Operating costs have also remained stable at just over $70 million per year.

4.1.2.3. State and Local Government

State and local expenditures for non-point source pollution control include the costs of reducing the risks of erosion run-off due to new highway construction and the costs of supporting administrative programs.

As with the non-EPA Federal cost estimates, state and local funding for agricultural erosion control programs are not entirely for water quality maintenance. Therefore, only a portion of these costs were attributed to water quality programs. All state and local highway erosion control costs were counted as water quality control efforts, however.

State and for local costs for capital construction have generally run around $50 million per year. Operating costs have been higher, averaging close to $200 million per year. The majority of these costs are for maintaining highway erosion control measures. Both capital and operating costs remained relatively constant from 1972 to 1986.

4.1.2.4. Private

Private expenditures for non-point source pollution control are primarily for agricultural erosion control and feedlot run-off control efforts. Private farms are required to match a small portion of Federal and state grant assistance for erosion control. As with public funding for agricultural erosion control, only a portion of these private expenditures were attributed to non-point source pollution control efforts.

Capital expenditures by private operators of farms and feedlots remained relatively stable over the period 1972-1986, averaging around $70 million per year. Operating expenses have also been stable, averaging $25 million per year.

4.1.3. Groundwater Protection

Since 1984, EPA has spent $35 million to assist states in building the institutional capacity to develop groundwater protection programs. These expenditures are for program organization, state regulatory development, education, and data management. The states have also contributed funds to these activities. Currently, no expenditures are being incurred by local communities or the private sector under this Clean Water Act Program. The costs of developing state groundwater and wellhead protection programs are discussed in Section 4.3.

Many other pollution control programs are directed in part to groundwater pollution control. It is not feasible to differentiate groundwater protection expenditures from broader measures of costs for these programs. Consequently, such costs are not included in this chapter. Nevertheless, it should be recognized that prevention of groundwater contamination is a major benefit of pollution control expenditures associated with several EPA regulatory programs. For example, costs presented in Chapter 5 relating to hazardous wastes corrective action under RCRA and Superfund have a major focus on the prevention and mitigation of groundwater contamination. Other RCRA rules discussed in Chapter 5, such as those involving restrictions on the disposal of hazardous wastes on land and in underground injection wells, as well as technical standards for underground storage tanks and solid waste disposal facilities, have a significant groundwater protection component. Programs to register and control the use of pesticides and toxic substances, which are discussed in Chapter 6, also afford some protection of groundwaters.

4.2. TOTAL WATER QUALITY

On an annualized basis, total water quality costs have increased substantially over time, from just over $9 billion in 1972 to an estimated $32.3 billion in 1987. This trend is projected to continue into the future, with total annualized costs reaching $56 billion by the year 2000. These costs are driven primarily by private spending for the control of industrial effluent discharges and the pretreatment of wastewater, and by local government spending for the construction and operation of sewerage and wastewater treatment facilities. Even with relatively large projected expenditures for municipal wastewater treatment over the coming years, however, significantly more expenditures would be needed to eliminate existing and projected future wastewater treatment needs by the year 2000.

4.3. DRINKING WATER

The nation's drinking water program derives from the 1974 Safe Drinking Water Act (SDWA) as amended in 1986. The Act directs EPA to establish "Maximum Contaminant Levels" or treatment requirements to ensure that public drinking water supplies do not pose unreasonable health risks. Interim regulations addressing microbiological contaminants, inorganics, radionuclides, a few pesticides, and the formation of trihalomethanes were promulgated by EPA in the 1970s and early 1980s. The 1986 SDWA amendments require EPA to promulgate standards for 83 contaminants, and to establish new regulations addressing surface water filtration and mandatory disinfection for all water supplies. These new regulations are currently being developed and implemented.

Implementation of the SDWA requirements involves a close Federal/state partnership whereby states assume a primacy role for implementing and enforcing Federal standards. The states also incur some costs for compliance with regulatory requirements, although most compliance costs are incurred by local government and private water supply systems.

As discussed in Chapter 1, only costs associated with improving environmental quality are included in this report. Thus, only the costs for drinking water treatment are shown in the tables.[4] Separate line items are provided to show total treatment costs and treatment costs pursuant to Federal mandates. The estimates were derived from a number of studies that estimated this "quality" component of total drinking water costs. (These studies are discussed in Appendix F.)

4.3.1. EPA

Federal program expenditures for the SDWA were between $70 and $80 million per year over the first half of the 1980s. In recent years they have been approximately $100 million per year. The increase is due mainly to expanded requirements imposed by the SDWA 1986 Amendments. Further increases will be necessary to fully implement the SDWA mandate. EPA costs are projected to reach $143 million in 1995 and $169 million by the year 2000.

4.3.2. State Government

State governments incur costs for implementation of drinking water programs as well as relatively low costs for compliance with applicable standards. Current expenditures for regulatory program implementation are approximately $95 million per year. State implementation expenditures are expected to increase as more Federal standards are promulgated. State compliance expenditures account for less than one percent of total state and local expenditures, however. This reflects that government water supplies are mostly owned and operated at the local level.

State costs are expected to increase in future years, reaching $150 million in 1995 and $185 million by the year 2000. These increases are driven in part by state efforts to develop and implement wellhead protection programs directed towards protecting groundwaters used by public water systems.

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[4] It should be noted that the bulk of expenditures made by water suppliers are unrelated to compliance with EPA contaminant limits or other measures to improve drinking water quality. Most drinking water costs are associated with supplying water to users, including expenditures for water acquisition, transport, and distribution. These are not included in this report, however.

4.3.3. Local Government

The bulk of all expenditures for treatment of drinking water supplies are incurred by local governments, the primary supplier of drinking water. Local government costs for water treatment increased steadily over time, from over $600 million in 1972 to $1.5 billion in 1980, and $2.4 billion in 1987. Only about $200 million of year 1987 costs were pursuant to Federal mandates, however, and none prior to 1979. Local government costs are expected to increase steadily in the coming years as new Federal regulations are promulgated and expanding populations increase the total demand for treated drinking water. New regulations pursuant to the 1986 SDWA amendments are expected to cost an additional $1.8 billion in local government costs by the year 2000. Total costs for local drinking water treatment are projected to reach $4 billion in 1995, and $5 billion by the year 2000. Federally-mandated costs are estimated to account for approximately 28 percent of year 1995 costs and 35 percent of total costs by the year 2000.

4.3.4. Private

The private sector is also a significant supplier of treated drinking water supplies. Private costs for the treatment of drinking water were an estimated $540 million in 1987. Future private costs are projected to reach $1.1 billion by the year 2000.

4.3.5. Total Drinking Water Costs

Total annualized costs associated with the treatment of drinking water supplies increased steadily over time, from a little more than $800 million in 1972 to $3.1 billion in 1987. Local governments accounted for approximately 78 percent of these costs, and the private sector, 17 percent. Only a very small percentage of total drinking water treatment costs incurred in recent years were pursuant to Federally-mandated standards, however, and none prior to 1979. In 1987, the estimated costs associated with Federal standards were approximately $200 million, or less than seven percent of total costs for drinking water treatment. Costs for Federal requirements are expected to increase dramatically in the next several years as new rules pursuant to the SDWA amendments of 1986 are implemented. Annualized costs due to Federal requirements are projected to reach $1.4 billion by 1995 and $2.2 billion by the year 2000. Most of these costs will be borne by local governments. Federally-mandated costs would represent approximately 27 percent of the estimated $5.3 billion in total drinking water costs in 1995, and 34 percent of the estimated $6.5 billion in total costs in the year 2000.

4.4. TOTAL WATER POLLUTION CONTROL COSTS

On an annualized basis, total water pollution control costs increased steadily over time, from about $9.9 billion in 1972 to $37.5 billion in 1987. Costs associated with point source control accounted for over 90 percent of these expenditures. Most of the historical point source control costs are due to local expenditures for sewerage services and wastewater treatment, and to private expenditures for the control of industrial effluents and the pretreatment of wastewater discharges to treatment facilities. Future costs are expected to increase significantly, reaching a projected $58 billion by the year 2000. These future costs are also driven primarily by point source control expenditures by local governments and the private sector. Moreover, if the costs associated with fulfilling the nation's current and projected future wastewater treatment needs are included, total costs would reach $64 billion by the year 2000. If only future costs associated with Federally-mandated programs are considered, however, then projected total costs drop slightly to approximately $60 billion in 2000. This difference is accounted for by non-Federally-driven costs for the treatment of drinking water.

Table 4-1: WATER POLLUTION CONTROL CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	1,044	1,607	3,312	3,906	4,589	6,209	5,067	5,349	5,734	4,755	4,413	3,316	2,828	2,950	3,113
	Non-EPA Federal			375	486	405	364	390	407	284	191	192	344	377	563	479
	State Government	261	258	291	296	307	370	403	430	435	424	357	287	355	395	405
	Local Government	4,056	2,861	2,181	1,869	926	664	955	1,164	1,761	1,935	2,020	2,728	2,406	2,085	2,675
	Private	7,091	7,759	6,763	6,925	7,572	7,731	7,827	7,514	6,574	5,670	5,442	5,425	5,838	5,783	5,781
	Total Point Source	12,452	12,486	12,922	13,482	13,799	15,338	14,642	14,865	14,787	12,975	12,423	12,101	11,803	11,776	12,453
	Federally Mandated	12,452	12,486	12,922	13,482	13,799	15,338	14,642	14,865	14,787	12,975	12,423	12,101	11,803	11,776	12,453
4.1.2	Non-Point Source															
	Existing Regulations															
	EPA															
	Non-EPA Federal	75	80	58	66	73	81	77	61	64	67	69	71	66	71	54
	State Government	60	55	48	52	51	44	39	41	43	41	46	44	47	46	47
	Local Government	60	60	59	59	60	61	60	59	59	59	60	60	59	60	58
	Private	75	79	65	71	76	82	77	64	67	67	69	70	66	71	54
4.2	Total Water Quality	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,090	15,020	13,211	12,666	12,345	12,043	12,023	12,666
	Federally Mandated	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,090	15,020	13,211	12,666	12,345	12,043	12,023	12,666
4.3	Drinking Water															
	EPA															
	Non-EPA Federal															
	State Government						4	25	63	83	60	58	47	23	27	31
	Local Government	602	630	709	749	731	662	654	749	816	817	783	725	728	855	997
	Private	135	141	159	168	164	148	146	168	183	183	175	162	163	191	223
	Total Drinking Water	736	772	868	917	895	814	825	979	1,081	1,060	1,016	935	915	1,073	1,251
	Federally Mandated								40	40	40	40	40	40	40	40
4.4	Total Water Costs	13,457	13,533	14,019	14,647	14,953	16,420	15,720	16,070	16,101	14,270	13,682	13,280	12,958	13,096	13,917
	Federally Mandated	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,130	15,060	13,251	12,706	12,385	12,083	12,063	12,706

Footnotes to Table 4-1

WATER QUALITY COSTS

POINT SOURCE

EPA: From annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays).

Non-EPA Federal: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

State Government: From Appendix F, Table F-7. See Appendix F for detail.

Local Government: From Appendix F, Table F-7. See Appendix F for detail.

Private: From Appendix F, Table F-7. See Appendix F for detail.

Point Source Existing Federally Mandated: Assumed to be 100 percent of point source water quality capital costs.

Total Point Source Federally Mandated: Assumed to be 100 percent of total point source water quality capital costs.

NON-POINT SOURCE WATER QUALITY COSTS: Figures estimated on the basis of the regulations and sources listed in Appendix E.

Non-Point Source Existing Federally Mandated: Assumed to be 100 percent of non-point source water quality capital costs.

Total Non-Point Source Federally Mandated: Assumed to be 100 percent of total non-point water quality capital costs.

Total Water Quality Federally Mandated: Assumed to be 100 percent of total water quality capital costs.

DRINKING WATER

EPA: Assumed to be zero; EPA drinking water costs are assumed to be operating costs.

State Government: From Appendix F, Table F-12. See Appendix F for detail.

Local Government: From Appendix F, Table F-12. See Appendix F for detail.

Private: From Appendix F, Table F-12. See Appendix F for detail.

Existing Federally Mandated: For years 1972-78, figures represent 0 percent of capital outlays for existing pollution control regulations. For years 1979-86, figures estimated on basis of the regulations and sources listed in Appendix F, Table F-5.

Total Federally Mandated: Figures represent the sum of total outlays associated with regulations for drinking water pollution control.

Table 4-1A: WATER POLLUTION CONTROL CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	3,113	2,831	2,271	2,038	1,971	1,879	1,395	898	434						
	Non-EPA Federal	479	616	690	764	838	912	986	1,060	1,133	1,207	1,281	1,355	1,429	1,503	1,577
	State Government	405	431	452	463	474	484	495	506	516	527	537	548	559	569	580
	Local Government	2,675	3,173	2,229	2,246	2,262	2,278	2,294	2,310	2,327	2,343	2,359	2,375	2,392	2,408	2,424
	Private	5,781	5,854	5,363	5,217	5,072	4,927	4,782	4,637	4,491	4,346	4,201	4,056	3,911	3,765	3,620
	Total Existing Regs	12,453	12,905	11,005	10,728	10,616	10,480	9,951	9,410	8,902	8,423	8,379	8,335	8,290	8,246	8,201
	Federally Mandated	12,453	12,905	11,005	10,728	10,616	10,480	9,951	9,410	8,902	8,423	8,379	8,335	8,290	8,246	8,201
	New Regulations															
	Local Government					19	19	116								
	Private			314	314	314										
	Total New Regs			314	314	333	19	116								
	Full Implementation					1,757	1,822	2,281	2,751	3,189	3,597	3,571	3,545	3,519	3,493	3,467
	Total Point Source	12,453	12,905	11,319	11,042	12,706	12,322	12,348	12,162	12,091	12,021	11,950	11,880	11,809	11,738	11,668
	Federally Mandated	12,453	12,905	11,319	11,042	12,706	12,322	12,348	12,162	12,091	12,021	11,950	11,880	11,809	11,738	11,668
4.1.2	Non-Point Source															
	Existing Regulations															
	Non-EPA Federal	54	63	63	62	61	61	60	59	58	58	57	56	56	55	54
	State Government	47	41	40	40	39	38	38	37	36	35	35	34	33	33	32
	Local Government	58	59	59	59	59	59	59	59	59	59	59	58	58	58	58
	Private	54	63	62	61	60	59	58	58	57	56	55	54	53	52	51
	Total Existing Regs	213	227	224	222	219	217	215	212	210	208	205	203	200	198	196
	Federally Mandated	213	227	224	222	219	217	215	212	210	208	205	203	200	198	196
	Total Non-Point Source	213	227	224	222	219	217	215	212	210	208	205	203	200	198	196
	Federally Mandated	213	227	224	222	219	217	215	212	210	208	205	203	200	198	196
4.2	Total Water Quality	12,666	13,132	11,543	11,264	12,926	12,539	12,563	12,374	12,301	12,228	12,155	12,082	12,009	11,937	11,864
	Federally Mandated	12,666	13,132	11,543	11,264	12,926	12,539	12,563	12,374	12,301	12,228	12,155	12,082	12,009	11,937	11,864
4.3	Drinking Water															
	Existing Regulations															
	State Government	31	18	51	54	57	60	63	66	68	71	74	77	80	83	85
	Local Government	997	982	897	896	912	928	944	960	977	993	1,009	1,025	1,041	1,057	1,066
	Private	223	220	201	201	204	208	211	215	219	222	226	230	233	237	239
	Total Existing Regs	1,251	1,220	1,149	1,150	1,173	1,196	1,218	1,241	1,264	1,286	1,309	1,332	1,354	1,377	1,390
	Federally Mandated	40	40	40												
	New Regulations															
	Local Government			29	59	65	310	707	960	1,128	1,380	1,460	1,109	522	184	184
	Private			7	13	15	69	158	215	253	309	327	249	117	41	41
	Total New Regs			36	73	80	379	865	1,175	1,381	1,690	1,787	1,358	639	225	225
	Total Drinking Water	1,251	1,220	1,185	1,223	1,253	1,575	2,083	2,416	2,645	2,976	3,096	2,690	1,993	1,602	1,615
	Federally Mandated	40	40	76	73	80	379	865	1,175	1,381	1,690	1,787	1,358	639	225	225
4.4	Total Water Costs	13,917	14,352	12,728	12,487	14,179	14,113	14,646	14,790	14,946	15,204	15,251	14,772	14,002	13,539	13,479
	Federally Mandated	12,706	13,172	11,619	11,336	13,006	12,918	13,428	13,549	13,682	13,918	13,942	13,440	12,648	12,162	12,089

Footnotes to Table 4-1A

WATER QUALITY COSTS

POINT SOURCE

EPA: Figures for 1986-1988 represent Outlays from annual Justification of Appropriation Estimates for Committee on Appropriations. Allocations of Construction Grant funds under Title II of the Clean Water Act end in 1990. Allocations to states by EPA under Title VI (State Revolving Funds) begin in 1989 and end in 1994. Figures for 1989 and 1990 represent 50% Title II expenditures and 50% Title VI expenditures. Figures for 1991-1994 are Title VI expenditures only. Projections for 1995-2000 cannot be made based on current trends.

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing State Government: 1986 and 1987 data from Appendix F, Table F-7. State expenditures will continue through 2000; however, each state will determine the amount it will give to local governments. Linear projection of expenditures for 1988-2000 based on historical data for the years 1978-1987.

Existing Local Government: 1986 and 1987 data from Appendix F, Table F-7. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Private: 1986 and 1987 figures from Appendix F, Table F-7. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Point Source Existing Federally Mandated: Assumed to be 100 percent of point source water quality capital costs.

New Local Government Water Quality: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private Water Quality: Estimated on the basis of the regulations and sources listed in Appendix A.

Full Implementation: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Point Source Federally Mandated: Assumed to be 100 percent of total point source water quality capital costs.

NON-POINT SOURCE WATER QUALITY COSTS: 1986 figure estimated on basis of regulations and sources presented in Appendix E; linear projection of expenditures for 1987-2000 based on historical data for the years 1972-1986.

Non-Point Source Existing Federally Mandated: Assumed to be 100 percent of total non-point source water quality capital costs.

Total Water Quality Federally Mandated: Assumed to be 100 percent of total water quality capital costs.

DRINKING WATER

EPA: Assumed to be zero; EPA drinking water costs are assumed to be operating costs.

State Government: 1986 and 1987 From Appendix F, Table F-12. See Appendix F for detail. Linear projection of expenditures for 1988-2000 based on data for the years 1972-1987.

Local Government: 1986 and 1987 from Appendix F, Table F-12. See Appendix F for detail. Linear projection of expenditures for 1988-2000 based on data for the years 1972-1987.

Private: 1986 and 1987 figures from Appendix F, Table F-12. See Appendix F for detail. Linear projection of expenditures for 1988-2000 based on data for the years 1972-1987.

Existing Federally Mandated: For the years 1989-2000, figures represent 0 percent of the capital outlays for existing pollution control. For 1986-1988, figures are estimated on basis of regulations and sources presented in Appendix F, Table F-5.

New Local Government Drinking Water: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private Drinking Water: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Figures represent the sum of total capital outlays associated with total existing regulations and total new regulations.

Table 4-2: WATER POLLUTION CONTROL OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	321	327	582	361	499	477	447	403	478	420	369	313	250	245	226
	Non-EPA Federal			247	284	299	271	289	283	293	256	301	311	282	309	381
	State Government	938	903	910	981	1,015	1,019	1,001	994	1,057	1,093	1,012	979	1,025	1,102	1,189
	Local Government	2,944	3,120	3,455	3,828	4,172	4,395	4,541	4,760	5,088	5,568	6,011	6,299	6,472	6,737	7,211
	Private	3,337	3,665	3,656	3,814	4,278	4,678	4,903	5,223	5,145	5,222	5,012	5,591	5,892	6,236	6,627
	Total Point Source	7,540	8,015	8,850	9,268	10,263	10,841	11,181	11,663	12,061	12,559	12,704	13,494	13,920	14,630	15,634
	Federally Mandated	7,540	8,015	8,850	9,268	10,263	10,841	11,181	11,663	12,061	12,559	12,704	13,494	13,920	14,630	15,634
4.1.2	Non-Point Source															
	Existing Regulations															
	EPA															
	Non-EPA Federal	81	86	62	70	79	87	81	66	68	74	75	77	73	76	58
	State Government	220	200	176	191	183	153	134	149	152	148	165	156	171	163	173
	Local Government	220	220	219	219	220	220	220	219	219	219	219	220	219	220	218
	Private	24	26	22	24	27	29	28	24	25	26	28	30	29	31	25
4.2	Total Water Quality	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,121	12,526	13,026	13,191	13,976	14,413	15,119	16,109
	Federally Mandated	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,121	12,526	13,026	13,191	13,976	14,413	15,119	16,109
4.3	Drinking Water															
	EPA	10	9	11	10	19	51	67	85	91	108	95	94	86	87	86
	Non-EPA Federal															
	State Government						10	18	18	23	30	33	33	30	32	42
	Local Government	590	598	623	665	719	750	808	879	918	993	1,053	1,074	1,107	1,168	1,239
	Private	132	134	140	149	161	168	181	197	206	222	236	241	248	262	277
	Total Drinking Water	732	741	774	824	899	979	1,073	1,180	1,238	1,353	1,417	1,442	1,471	1,549	1,645
	Federally Mandated								167	167	167	167	167	167	167	167
4.4	Total Water Costs	8,817	9,288	10,102	10,596	11,671	12,309	12,717	13,301	13,764	14,379	14,608	15,419	15,884	16,668	17,753
	Federally Mandated	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,288	12,693	13,193	13,358	14,143	14,580	15,286	16,276

Footnotes to Table 4-2

WATER QUALITY COSTS

POINT SOURCE

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays).

Non-EPA Federal: 1981-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

State Government: From Appendix F, Table F-7. See Appendix F for detail.

Local Government: From Appendix F, Table F-7. See Appendix F for detail.

Private: From Appendix F, Table F-7. See Appendix F for detail.

Point Source Existing Federally Mandated: Assumed to be 100 percent of point source water quality operating costs.
Total Point Source Federally Mandated: Assumed to be 100 percent of total point source water quality operating costs.

NON-POINT SOURCE WATER QUALITY COSTS: Figures estimated on the basis of the regulations and sources listed in Appendix E.

Non-Point Source Existing Federally Mandated: Assumed to be 100 percent of non-point source water quality operating costs.

Total Non-Point Source Federally Mandated: Assumed to be 100 percent of total non-point source water quality operating costs.

Total Water Quality Federally Mandated: Assumed to be 100 percent of total water quality operating costs.

DRINKING WATER

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays).

State Government: From Appendix F, Table F-12. See Appendix F for detail.

Local Government: From Appendix F, Table F-12. See Appendix F for detail.

Private: From Appendix F, Table F-12. See Appendix F for detail.

Existing Federally Mandated: For the years 1972-1978, figures represent 0 percent of the outlays for existing pollution control regulations. For 1979-86, figures estimated on basis of regulations and sources listed in Appendix F, Table F-5.

Total Federally Mandated: Figures represent the sum of total operating outlays for regulations associated with water pollution control.

Table 4-2A: WATER POLLUTION CONTROL OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	226	232	242	235	278	288	222	210	198	186	174	162	150	137	125
	Non-EPA Federal	381	369	386	404	422	440	457	475	493	510	528	546	564	581	599
	State Government	1,189	1,210	1,156	1,172	1,187	1,202	1,217	1,233	1,248	1,263	1,278	1,294	1,309	1,324	1,339
	Local Government	7,211	7,450	7,716	8,021	8,325	8,630	8,934	9,239	9,543	9,848	10,152	10,457	10,761	11,066	11,370
	Private	6,627	7,360	7,011	7,243	7,474	7,706	7,938	8,170	8,402	8,634	8,866	9,097	9,329	9,561	9,793
	Total Existing Regs	15,634	16,621	16,512	17,074	17,686	18,266	18,769	19,326	19,884	20,441	20,998	21,555	22,112	22,669	23,227
	Federally Mandated	15,634	16,621	16,512	17,074	17,686	18,266	18,769	19,326	19,884	20,441	20,998	21,555	22,112	22,669	23,227
	New Regulations															
	Local Government			2	5	17	30	40	73	73	73	73	73	73	73	73
	Private				137	274	489	489	489	489	489	489	489	489	489	489
	Total New Regs			2	142	291	519	529	562	562	562	562	562	562	562	562
	Full Implementation					176	358	586	861	1,180	1,540	1,897	2,251	2,603	2,953	3,299
	Total Point Source	15,634	16,621	16,514	17,216	18,153	19,143	19,884	20,750	21,626	22,543	23,457	24,369	25,278	26,184	27,088
	Federally Mandated	15,634	16,621	16,514	17,216	18,153	19,143	19,884	20,750	21,626	22,543	23,457	24,369	25,278	26,184	27,088
4.1.2	Non-Point Source															
	Existing Regulations															
	Non-EPA Federal	58	69	68	67	67	66	65	65	64	63	63	62	61	61	60
	State Government	173	147	145	142	139	136	134	131	128	126	123	120	118	115	112
	Local Government	218	219	219	219	219	219	219	219	219	219	218	218	218	218	218
	Private	25	29	29	30	30	30	31	31	31	32	32	32	33	33	33
	Total Existing Regs	475	464	461	458	455	452	449	446	442	439	436	433	430	427	424
	Federally Mandated	475	464	461	458	455	452	449	446	442	439	436	433	430	427	424
	Total Non-Point Source	475	464	461	458	455	452	449	446	442	439	436	433	430	427	424
	Federally Mandated	475	464	461	458	455	452	449	446	442	439	436	433	430	427	424
4.2	Total Water Quality	16,109	17,085	16,975	17,674	18,608	19,595	20,333	21,195	22,068	22,982	23,893	24,802	25,708	26,611	27,512
	Federally Mandated	16,109	17,085	16,975	17,674	18,608	19,595	20,333	21,195	22,068	22,982	23,893	24,802	25,708	26,611	27,512
4.3	Drinking Water															
	Existing Regulations															
	EPA	86	94	95	97	103	108	127	132	137	143	148	153	159	164	169
	State Government	42	23	42	45	48	51	54	56	59	62	65	68	70	73	76
	Local Government	1,239	1,261	1,195	1,159	1,194	1,230	1,265	1,301	1,336	1,372	1,407	1,442	1,478	1,513	1,531
	Private	277	283	268	260	268	275	283	291	299	307	315	323	331	339	343
	Total Existing Regs	1,645	1,661	1,600	1,560	1,613	1,664	1,729	1,780	1,832	1,883	1,935	1,986	2,038	2,090	2,119
	Federally Mandated	167	167	167												
	New Regulations															
	Local Government			73	146	146	260	424	474	565	717	779	808	934	1,029	1,029
	Private			16	33	33	58	95	106	126	161	174	181	209	230	230
	Total New Regs			89	178	179	319	519	580	691	878	953	990	1,143	1,259	1,259
	Total Drinking Water	1,645	1,661	1,689	1,738	1,792	1,982	2,248	2,360	2,523	2,761	2,888	2,976	3,181	3,349	3,379
	Federally Mandated	167	167	256	178	179	319	519	580	691	878	953	990	1,143	1,259	1,259
4.4	Total Water Costs	17,753	18,746	18,664	19,412	20,399	21,577	22,581	23,555	24,591	25,743	26,781	27,778	28,888	29,960	30,890
	Federally Mandated	16,276	17,252	17,231	17,852	18,786	19,913	20,852	21,775	22,759	23,860	24,846	25,791	26,850	27,870	28,771

Footnotes to Table 4-2A

WATER QUALITY COSTS

POINT SOURCE

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on historical data for the years 1972-1990.

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing State Government: 1986 and 1987 data from Appendix F, Table F-7. Linear projection of expenditures for 1988-2000 based on historical data for the years 1978-1987.

Existing Local Government: 1986 and 1987 data from Appendix F, Table F-7. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Existing Private: 1986 and 1987 data from Appendix F, Table F-7. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Point Source Existing Federally Mandated: Assumed to be 100 percent of point source water quality operating costs.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Full Implementation: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Point Source Federally Mandated: Assumed to be 100 percent of total point source water quality operating costs.

NON-POINT SOURCE WATER QUALITY COSTS: 1986 figure estimated on basis of regulations and sources presented in Appendix E; linear projection of expenditures for 1987-2000 based on historical data for the years 1972-1986.

Non-Point Source Existing Federally Mandated: Assumed to be 100 percent of non-point source water quality operating costs.

Total Non-Point Source Federally Mandated: Assumed to be 100 percent of total non-point source water quality operating costs.

Total Water Quality Federally Mandated: Assumed to be 100 percent of total water quality operating costs.

DRINKING WATER

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on historical data for the years 1972-1990.

State Government: 1986 and 1987 figures from Appendix F, Table F-12. Linear projection of expenditures for 1988-2000 based on data for the years 1972-1987.

Existing Local Government: 1986 and 1987 figures from Appendix F, Table F-12. Linear projection of expenditures for 1988-2000 based on data for the years 1972-1987.

Existing Private: 1986 and 1987 figures from Appendix F, Table F-12. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Existing Federally Mandated: For the years 1989-2000, figures represent 0 percent of the total outlays for pollution control. For the years 1986-1988, figures are estimated on regulations and sources presented in Appendix F, Table F-5.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Figures represent the sum of total outlays associated with total existing regulations and total new regulations.

Table 4-3: WATER POLLUTION CONTROL COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	405	540	1,063	1,156	1,664	2,142	2,521	2,908	3,445	3,770	4,075	4,286	4,451	4,684	4,915
	Non-EPA Federal			277	353	401	402	452	479	511	490	550	588	589	662	772
	State Government	959	945	975	1,070	1,129	1,163	1,177	1,205	1,303	1,373	1,320	1,311	1,386	1,495	1,614
	Local Government	3,271	3,677	4,188	4,712	5,130	5,407	5,630	5,943	6,413	7,049	7,654	8,163	8,529	8,962	9,652
	Private	3,909	4,862	5,397	6,114	7,188	8,211	9,067	9,992	10,444	10,978	11,206	12,222	12,994	13,805	14,661
	Total Point Source	8,543	10,025	11,901	13,406	15,513	17,326	18,846	20,526	22,116	23,660	24,806	26,571	27,949	29,607	31,615
	Federally Mandated	8,543	10,025	11,901	13,406	15,513	17,326	18,846	20,526	22,116	23,660	24,806	26,571	27,949	29,607	31,615
4.1.2	Non-Point Source															
	Existing Regulations															
	EPA															
	Non-EPA Federal	87	98	79	92	107	121	123	112	119	130	137	145	146	155	142
	State Government	225	209	189	208	205	178	162	180	187	186	207	201	220	216	230
	Local Government	225	230	233	239	244	249	254	258	263	267	272	277	282	287	290
	Private	30	38	39	47	57	65	70	72	78	84	92	99	104	111	110
4.2	Total Water Quality	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,147	22,763	24,328	25,514	27,294	28,700	30,376	32,386
	Federally Mandated	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,147	22,763	24,328	25,514	27,294	28,700	30,376	32,386
4.3	Drinking Water															
	EPA	10	9	11	10	19	51	67	85	91	108	95	94	86	87	86
	Non-EPA Federal															
	State Government						10	21	27	40	52	61	65	64	69	82
	Local Government	647	714	807	919	1,042	1,136	1,255	1,397	1,512	1,665	1,799	1,888	1,990	2,131	2,296
	Private	145	160	181	206	233	254	281	313	339	373	403	423	446	477	514
	Total Drinking Water	802	883	998	1,135	1,294	1,451	1,623	1,823	1,982	2,198	2,357	2,471	2,586	2,765	2,979
	Federally Mandated								171	175	178	182	186	190	193	197
4.4	Total Water Costs	9,912	11,484	13,439	15,126	17,419	19,391	21,078	22,970	24,745	26,525	27,871	29,765	31,286	33,141	35,365
	Federally Mandated	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,318	22,938	24,506	25,696	27,480	28,890	30,569	32,583

Footnotes to Table 4-3

Sum of operating costs for year in question, shown on corresponding lines of Table 4-2, plus amortized capital costs assuming an interest rate of 7 percent and a capital life of 30 years for water quality and 20 years for drinking water on the accumulated capital investment shown in Table 4-1 since 1972.

Table 4-3A: WATER POLLUTION CONTROL COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	4,915	5,149	5,343	5,499	5,702	5,863	5,910	5,970	5,993	5,981	5,969	5,957	5,944	5,932	5,920
	Non-EPA Federal	772	810	883	962	1,048	1,139	1,236	1,339	1,448	1,563	1,684	1,811	1,944	2,083	2,227
	State Government	1,614	1,670	1,653	1,705	1,758	1,813	1,868	1,924	1,981	2,038	2,097	2,156	2,217	2,278	2,340
	Local Government	9,652	10,147	10,592	11,078	11,565	12,053	12,542	13,033	13,525	14,018	14,513	15,008	15,506	16,004	16,504
	Private	14,661	15,866	15,949	16,601	17,242	17,871	18,488	19,093	19,687	20,269	20,840	21,398	21,945	22,481	23,004
	Total Existing Regs	31,615	33,642	34,419	35,846	37,314	38,738	40,043	41,359	42,633	43,869	45,102	46,331	47,556	48,777	49,996
	Federally Mandated	31,615	33,642	34,419	35,846	37,314	38,738	40,043	41,359	42,633	43,869	45,102	46,331	47,556	48,777	49,996
	New Regulations															
	Local Government			2	5	19	33	52	85	85	85	85	85	85	85	85
	Private			25	188	350	565	565	565	565	565	565	565	565	565	565
	Total New Regs			27	193	368	598	617	650	650	650	650	650	650	650	650
	Full Implementation					317	646	1,058	1,555	2,131	2,781	3,426	4,066	4,701	5,332	5,958
	Total Point Source	31,615	33,642	34,447	36,038	38,000	39,982	41,719	43,564	45,415	47,300	49,178	51,047	52,907	54,760	56,604
	Federally Mandated	31,615	33,642	34,447	36,038	38,000	39,982	41,719	43,564	45,415	47,300	49,178	51,047	52,907	54,760	56,604
4.1.2	Non-Point Source															
	Existing Regulations															
	Non-EPA Federal	142	157	162	166	170	174	179	183	187	191	195	198	202	206	210
	State Government	230	207	208	208	209	209	210	210	210	210	210	210	210	210	210
	Local Government	290	296	300	305	310	315	319	324	329	333	338	343	347	352	356
	Private	110	119	124	129	135	140	145	150	155	159	164	169	173	178	182
	Total Existing Regs	771	779	794	809	823	838	852	866	880	893	907	920	933	946	959
	Federally Mandated	771	779	794	809	823	838	852	866	880	893	907	920	933	946	959
	Total Non-Point Source	771	779	794	809	823	838	852	866	880	893	907	920	933	946	959
	Federally Mandated	771	779	794	809	823	838	852	866	880	893	907	920	933	946	959
4.2	Total Water Quality	32,386	34,421	35,241	36,847	38,823	40,820	42,571	44,430	46,295	48,194	50,085	51,967	53,840	55,706	57,563
	Federally Mandated	32,386	34,421	35,241	36,847	38,823	40,820	42,571	44,430	46,295	48,194	50,085	51,967	53,840	55,706	57,563
4.3	Drinking Water															
	Existing Regulations															
	EPA	86	94	95	97	103	108	127	132	137	143	148	153	159	164	169
	State Government	82	65	89	97	105	113	122	131	140	150	160	169	177	182	185
	Local Government	2,296	2,412	2,430	2,479	2,600	2,723	2,791	2,857	2,918	2,976	3,038	3,108	3,180	3,244	3,286
	Private	514	540	544	555	582	610	625	640	654	667	681	696	712	727	736
	Total Existing Regs	2,979	3,111	3,158	3,227	3,390	3,554	3,665	3,760	3,849	3,936	4,026	4,127	4,228	4,317	4,376
	Federally Mandated	197	201	205	38	38	38	38	38	38	38	38	38	38	34	30
	New Regulations															
	Local Government			76	154	161	304	535	675	872	1,155	1,354	1,489	1,663	1,776	1,793
	Private			17	34	36	68	120	151	195	259	303	333	373	398	402
	Total New Regs			92	188	196	372	654	826	1,068	1,414	1,658	1,822	2,036	2,174	2,195
	Total Drinking Water	2,979	3,111	3,250	3,415	3,587	3,926	4,319	4,586	4,917	5,350	5,684	5,949	6,264	6,491	6,571
	Federally Mandated	197	201	297	226	234	410	692	864	1,105	1,452	1,696	1,860	2,074	2,208	2,225
4.4	Total Water Costs	35,365	37,531	38,491	40,262	42,410	44,746	46,890	49,017	51,212	53,543	55,769	57,916	60,104	62,197	64,134
	Federally Mandated	32,583	34,622	35,538	37,073	39,057	41,230	43,263	45,294	47,400	49,645	51,700	53,827	55,914	57,913	59,788

Footnotes to Table 4-3A

Sum of operating costs for year in question, shown on corresponding lines of Table 4-2A, plus amortized capital costs assuming an interest rate of 7 percent and a capital life of 30 years for water quality and 20 years for drinking water on the accumulated capital investment shown in Tables 4-1 and 4-1A since 1972.

Table 4-3B: WATER POLLUTION CONTROL COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	374	462	886	864	1,236	1,531	1,760	1,989	2,356	2,541	2,715	2,829	2,910	3,055	3,195
	Non-EPA Federal			266	328	364	354	392	407	431	404	459	486	477	532	629
	State Government	951	930	951	1,038	1,087	1,110	1,112	1,128	1,213	1,270	1,207	1,189	1,233	1,351	1,458
	Local Government	3,151	3,473	3,919	4,387	4,779	5,036	5,231	5,509	5,927	6,505	7,052	7,479	7,774	8,146	8,736
	Private	3,699	4,423	4,758	5,271	6,121	6,915	7,539	8,242	8,500	8,866	8,934	9,789	10,388	11,028	11,713
	Total Point Source	8,175	9,288	10,782	11,888	13,587	14,947	16,034	17,274	18,427	19,587	20,366	21,773	22,802	24,112	25,751
	Federally Mandated	8,175	9,288	10,782	11,888	13,587	14,947	16,034	17,274	18,427	19,587	20,366	21,773	22,802	24,112	25,751
4.1.2	Non-Point Source															
	Existing Regulations															
	EPA															
	Non-EPA Federal	85	94	73	84	97	109	107	95	100	109	114	120	119	126	111
	State Government	223	206	184	202	197	169	151	168	175	172	192	185	202	196	209
	Local Government	223	226	228	232	235	239	241	243	247	250	253	256	259	262	264
	Private	28	33	33	38	46	52	55	54	59	63	68	73	76	82	79
4.2	Total Water Quality	8,734	9,847	11,299	12,443	14,161	15,515	16,589	17,835	19,007	20,181	20,993	22,408	23,458	24,778	26,414
	Federally Mandated	8,734	9,847	11,299	12,443	14,161	15,515	16,589	17,835	19,007	20,181	20,993	22,408	23,458	24,778	26,414
4.3	Drinking Water															
	EPA	10	9	11	10	19	51	67	85	91	108	95	94	86	87	86
	Non-EPA Federal															
	State Government						10	20	25	35	46	53	56	54	58	71
	Local Government	630	680	754	846	949	1,025	1,126	1,248	1,341	1,472	1,584	1,654	1,735	1,854	1,992
	Private	141	152	169	190	213	230	252	280	300	330	355	370	389	415	446
	Total Drinking Water	782	842	933	1,046	1,181	1,315	1,465	1,638	1,768	1,955	2,087	2,175	2,265	2,415	2,595
	Federally Mandated								170	172	175	178	180	183	186	189
4.4	Total Water Costs	9,516	10,689	12,233	13,489	15,342	16,830	18,054	19,473	20,775	22,136	23,079	24,582	25,723	27,193	29,009
	Federally Mandated	8,734	9,847	11,299	12,443	14,161	15,515	16,589	18,005	19,179	20,356	21,171	22,588	23,641	24,964	26,602

Footnotes to Table 4-3B

Sum of operating costs for year in question, shown on corresponding lines of Table 4-2, plus amortized capital costs assuming an interest rate of 3 percent and a capital life of 30 years for water quality and 20 years for drinking water on the accumulated capital investment shown in Table 4-1 since 1972.

Table 4-3C: WATER POLLUTION CONTROL COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	3,195	3,345	3,471	3,568	3,712	3,818	3,823	3,857	3,867	3,855	3,843	3,830	3,818	3,806	3,794
	Non-EPA Federal	629	648	701	758	818	882	950	1,022	1,098	1,177	1,260	1,347	1,437	1,532	1,630
	State Government	1,458	1,501	1,471	1,509	1,549	1,589	1,629	1,670	1,712	1,754	1,797	1,840	1,884	1,928	1,973
	Local Government	8,756	9,157	9,537	9,956	10,376	10,797	11,218	11,641	12,064	12,488	12,913	13,338	13,765	14,192	14,620
	Private	11,713	12,745	12,669	13,167	13,658	14,141	14,617	15,085	15,547	16,000	16,446	16,885	17,316	17,740	18,157
	Total Existing Regs	25,751	27,397	27,849	28,958	30,112	31,227	32,238	33,275	34,287	35,273	36,258	37,240	38,221	39,198	40,174
	Federally Mandated	25,751	27,397	27,849	28,958	30,112	31,227	32,238	33,275	34,287	35,273	36,258	37,240	38,221	39,198	40,174
	New Regulations															
	Local Government			2	5	18	32	48	81	81	81	81	81	81	81	81
	Private			16	169	322	537	537	537	537	537	537	537	537	537	537
	Total New Regs			18	174	340	569	585	618	618	618	618	618	618	618	618
	Full Implementation					265	541	885	1,301	1,782	2,325	2,865	3,400	3,931	4,459	4,983
	Total Point Source	25,751	27,397	27,867	29,132	30,718	32,336	33,708	35,194	36,687	38,217	39,741	41,258	42,770	44,275	45,774
	Federally Mandated	25,751	27,397	27,867	29,132	30,718	32,336	33,708	35,194	36,687	38,217	39,741	41,258	42,770	44,275	45,774
4.1.2	Non-Point Source															
	Existing Regulations															
	Non-EPA Federal	111	125	127	130	132	135	137	139	142	144	146	148	151	153	155
	State Government	209	185	185	184	183	183	182	181	180	179	178	177	176	175	174
	Local Government	264	268	271	274	276	279	282	285	288	291	294	297	300	303	306
	Private	79	86	89	93	96	100	103	106	109	113	116	119	122	125	128
	Total Existing Regs	663	664	672	680	688	696	704	712	719	727	734	741	749	756	762
	Federally Mandated	663	664	672	680	688	696	704	712	719	727	734	741	749	756	762
	Total Non-Point Source	663	664	672	680	688	696	704	712	719	727	734	741	749	756	762
	Federally Mandated	663	664	672	680	688	696	704	712	719	727	734	741	749	756	762
4.2	Total Water Quality	26,414	28,060	28,539	29,812	31,406	33,032	34,412	35,905	37,406	38,944	40,475	42,000	43,519	45,031	46,537
	Federally Mandated	26,414	28,060	28,539	29,812	31,406	33,032	34,412	35,905	37,406	38,944	40,475	42,000	43,519	45,031	46,537
4.3	Drinking Water															
	Existing Regulations															
	EPA	86	94	95	97	103	108	127	132	137	143	148	153	159	164	169
	State Government	71	53	75	82	88	95	102	110	117	125	132	140	147	151	154
	Local Government	1,992	2,081	2,074	2,099	2,195	2,293	2,352	2,409	2,463	2,516	2,569	2,628	2,690	2,746	2,781
	Private	446	466	465	470	492	514	527	540	552	563	575	589	602	615	623
	Total Existing Regs	2,595	2,693	2,709	2,747	2,879	3,010	3,107	3,190	3,268	3,345	3,424	3,510	3,598	3,676	3,726
	Federally Mandated	189	191	194	27	27	27	27	27	27	27	27	27	27	24	22
	New Regulations															
	Local Government			75	151	156	292	503	617	784	1,029	1,189	1,293	1,453	1,561	1,573
	Private			17	34	35	65	113	138	176	230	266	290	325	350	352
	Total New Regs			91	185	191	357	615	755	959	1,260	1,455	1,583	1,779	1,910	1,926
	Total Drinking Water	2,595	2,693	2,801	2,932	3,070	3,367	3,723	3,945	4,228	4,604	4,879	5,093	5,376	5,586	5,652
	Federally Mandated	189	191	285	212	218	384	642	782	986	1,286	1,482	1,609	1,806	1,935	1,947
4.4	Total Water Costs	29,009	30,754	31,340	32,745	34,476	36,399	38,134	39,851	41,634	43,548	45,354	47,093	48,895	50,617	52,189
	Federally Mandated	26,602	28,251	28,824	30,025	31,624	33,416	35,054	36,687	38,392	40,230	41,957	43,609	45,324	46,965	48,484

Footnotes to Table 4-3C

Sum of operating costs for year in question, shown on corresponding lines of Table 4-2A, plus amortized capital costs assuming an interest rate of 3 percent and a capital life of 30 years for water quality and 20 years for drinking water on the accumulated capital investment shown in Tables 4-1 and 4-1A since 1972.

Table 4-3D: WATER POLLUTION CONTROL COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	432	608	1,215	1,408	2,032	2,669	3,177	3,700	4,383	4,830	5,247	5,543	5,780	6,088	6,399
	Non-EPA Federal			287	375	433	444	503	540	581	564	629	676	687	773	896
	State Government	965	958	996	1,098	1,165	1,208	1,233	1,272	1,381	1,462	1,418	1,416	1,500	1,619	1,748
	Local Government	3,375	3,853	4,420	4,991	5,433	5,728	5,975	6,317	6,832	7,517	8,174	8,752	9,179	9,666	10,424
	Private	4,089	5,241	5,948	6,842	8,109	9,329	10,384	11,501	12,121	12,799	13,166	14,320	15,241	16,199	17,203
	Total Point Source	8,861	10,661	12,866	14,714	17,173	19,378	21,271	23,330	25,297	27,171	28,635	30,708	32,386	34,345	36,670
	Federally Mandated	8,861	10,661	12,866	14,714	17,173	19,378	21,271	23,330	25,297	27,171	28,635	30,708	32,386	34,345	36,670
4.1.2	Non-Point Source															
	Existing Regulations															
	EPA															
	Non-EPA Federal	89	102	84	99	116	132	136	127	135	148	156	167	169	180	168
	State Government	226	212	193	213	212	186	171	190	198	198	220	216	236	233	248
	Local Government	226	233	238	245	252	259	265	270	276	283	289	296	302	308	313
	Private	32	42	45	54	66	77	84	87	95	103	112	121	127	136	137
4.2	Total Water Quality	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,003	26,001	27,903	29,412	31,506	33,220	35,202	37,535
	Federally Mandated	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,003	26,001	27,903	29,412	31,506	33,220	35,202	37,535
4.3	Drinking Water															
	EPA	10	9	11	10	19	51	67	85	91	108	95	94	86	87	86
	Non-EPA Federal															
	State Government						10	21	29	44	57	67	73	73	78	92
	Local Government	661	742	851	981	1,121	1,230	1,364	1,524	1,658	1,829	1,981	2,087	2,205	2,367	2,555
	Private	148	166	191	220	251	276	306	341	371	410	444	468	494	530	572
	Total Drinking Water	819	918	1,053	1,211	1,391	1,567	1,758	1,980	2,164	2,404	2,587	2,722	2,858	3,062	3,305
	Federally Mandated								172	176	181	186	190	195	200	205
4.4	Total Water Costs	10,253	12,168	14,479	16,537	19,209	21,598	23,683	25,983	28,165	30,307	31,999	34,229	36,079	38,264	40,840
	Federally Mandated	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,175	26,178	28,084	29,598	31,697	33,415	35,402	37,740

Footnotes to Table 4-3D

Sum of operating costs for year in question, shown on corresponding lines of Table 4-2, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 30 years for water quality and 20 years for drinking water on the accumulated capital investment shown in Table 4-1 since 1972.

Table 4-3E: WATER POLLUTION CONTROL COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
4.1	Water Quality															
4.1.1	Point Source															
	Existing Regulations															
	EPA	6,399	6,705	6,956	7,165	7,417	7,627	7,709	7,792	7,826	7,814	7,802	7,790	7,778	7,765	7,753
	Non-EPA Federal	896	949	1,040	1,139	1,246	1,360	1,482	1,612	1,750	1,896	2,050	2,211	2,381	2,558	2,743
	State Government	1,748	1,816	1,809	1,874	1,939	2,006	2,074	2,143	2,213	2,284	2,356	2,429	2,504	2,579	2,656
	Local Government	10,424	11,000	11,502	12,045	12,589	13,135	13,683	14,233	14,784	15,337	15,892	16,448	17,007	17,566	18,128
	Private	17,203	18,557	18,776	19,562	20,331	21,086	21,825	22,549	23,257	23,950	24,627	25,290	25,936	26,568	27,183
	Total Existing Regs	36,670	39,026	40,084	41,784	43,523	45,214	46,773	48,329	49,830	51,281	52,727	54,168	55,605	57,037	58,464
	Federally Mandated	36,670	39,026	40,084	41,784	43,523	45,214	46,773	48,329	49,830	51,281	52,727	54,168	55,605	57,037	58,464
	New Regulations															
	Local Government			2	5	19	34	56	89	89	89	89	89	89	89	89
	Private			33	204	374	589	589	589	589	589	589	589	589	589	589
	Total New Regs			35	209	393	623	645	678	678	678	678	678	678	678	678
	Full Implementation					362	738	1,208	1,775	2,432	3,173	3,909	4,640	5,365	6,085	6,799
	Total Point Source	36,670	39,026	40,120	41,993	44,278	46,575	48,626	50,782	52,940	55,132	57,314	59,486	61,648	63,799	65,941
	Federally Mandated	36,670	39,026	40,120	41,993	44,278	46,575	48,626	50,782	52,940	55,132	57,314	59,486	61,648	63,799	65,941
4.1.2	Non-Point Source															
	Existing Regulations															
	Non-EPA Federal	168	185	191	197	203	209	214	220	225	231	236	242	247	252	257
	State Government	248	226	228	229	231	232	233	235	236	237	238	239	240	240	241
	Local Government	313	320	326	332	339	345	351	357	363	369	376	382	388	394	400
	Private	137	147	154	161	168	174	181	187	194	200	206	212	218	224	230
	Total Existing Regs	865	879	899	920	940	960	980	999	1,018	1,037	1,056	1,074	1,092	1,110	1,128
	Federally Mandated	865	879	899	920	940	960	980	999	1,018	1,037	1,056	1,074	1,092	1,110	1,128
	Total Non-Point Source	865	879	899	920	940	960	980	999	1,018	1,037	1,056	1,074	1,092	1,110	1,128
	Federally Mandated	865	879	899	920	940	960	980	999	1,018	1,037	1,056	1,074	1,092	1,110	1,128
4.2	Total Water Quality	37,535	39,905	41,019	42,912	45,218	47,535	49,606	51,781	53,958	56,169	58,370	60,560	62,740	64,910	67,069
	Federally Mandated	37,535	39,905	41,019	42,912	45,218	47,535	49,606	51,781	53,958	56,169	58,370	60,560	62,740	64,910	67,069
4.3	Drinking Water															
	Existing Regulations															
	EPA	86	94	95	97	103	108	127	132	137	143	148	153	159	164	169
	State Government	92	75	100	109	119	129	139	149	160	171	183	194	203	209	212
	Local Government	2,555	2,693	2,732	2,801	2,944	3,088	3,164	3,238	3,305	3,369	3,437	3,515	3,596	3,667	3,715
	Private	572	603	612	627	659	692	709	725	740	755	770	787	805	821	832
	Total Existing Regs	3,305	3,465	3,538	3,634	3,825	4,016	4,138	4,244	4,342	4,437	4,537	4,650	4,763	4,862	4,928
	Federally Mandated	205	209	214	47	47	47	47	47	47	47	47	47	47	42	38
	New Regulations															
	Local Government			76	156	164	315	562	724	947	1,262	1,495	1,655	1,842	1,958	1,980
	Private			17	35	37	71	126	162	212	283	335	371	412	439	444
	Total New Regs			93	191	201	385	687	886	1,160	1,545	1,830	2,026	2,254	2,397	2,424
	Total Drinking Water	3,305	3,465	3,632	3,825	4,025	4,401	4,825	5,130	5,502	5,982	6,367	6,676	7,017	7,259	7,351
	Federally Mandated	205	209	307	238	248	432	734	933	1,207	1,592	1,877	2,073	2,301	2,439	2,461
4.4	Total Water Costs	40,840	43,370	44,651	46,737	49,243	51,936	54,431	56,911	59,460	62,151	64,737	67,236	69,758	72,168	74,420
	Federally Mandated	37,740	40,114	41,326	43,150	45,466	47,967	50,340	52,714	55,165	57,761	60,247	62,633	65,041	67,349	69,530

Footnotes to Table 4-3E

Sum of operating costs for year in question, shown on corresponding lines of Table 4-2A, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 30 years for water quality and 20 years for drinking water on the accumulated capital investment shown in Tables 4-1 and 4-1A since 1972.

5. COSTS OF LAND POLLUTION CONTROL

Tables 5-1, 5-2, and 5-3 provide data on capital costs, operation and maintenance costs, and total annualized costs for land pollution control. The estimates are broken down into several categories which are discussed in the sections indicated below.

5.1. Solid waste;
5.2. Hazardous waste;
5.3. Leaking Underground Storage Tanks;
5.4. Total Resource Conservation and Recovery Act;
5.5. Superfund; and
5.6. Total land pollution control costs.

Table 5-3 provides annualized cost estimates calculated using capital amortization rates of three, seven, and ten percent, and an assumed capital life of 20 years for solid and hazardous waste programs, and 30 years for the underground storage tanks and Superfund programs.

The annualized cost estimates discussed below are those calculated using a seven percent rate for capital amortization. Those calculated using a three percent rate are approximately three to 11 percent lower, and those calculated using a ten percent rate are three to nine percent higher, than the estimates discussed below.

5.1. SOLID WASTE

EPA expenditures for solid waste have historically been relatively low since activities were authorized by Subtitle D of the 1976 Resource Conservation and Recovery Act (RCRA). EPA solid waste expenditures have been rising in recent years, however, as more attention has focused on expanded regulation of wastes that are not defined as hazardous under Subtitle C of RCRA. State involvement varies but, for the most part, state programs have developed independently of the Federal program. State expenditures for program implementation are relatively low. Local governments have relatively high expenditures due primarily to the provision of services associated with the collection and disposal of household wastes and, to a lesser extent, for compliance with standards for solid waste disposal facilities. The private sector also provides solid waste collection and disposal services.

Total annualized solid waste costs for all sectors, including costs for trash collection and disposal services, increased from $8.4 billion in 1972 to $16.7 billion in 1987. Future annualized costs are expected to increase steadily, reaching a projected $22.5 billion by the year 2000. Costs for Federally-mandated programs accounted for only a small part of historical solid waste costs, however, from less than $500 million in 1972 and about $1.1 billion in 1987. Future costs for Federally-mandated programs are expected to remain a small portion of total solid waste costs. Future annualized costs associated with Federal mandates are expected to increase to a projected $3.6 billion by the year 2000. These costs are driven primarily by expanded Federal regulation of municipal solid waste disposal facilities pursuant to RCRA Subtitle D.

5.1.1. EPA

The framework for the EPA solid waste program was set forth in Subtitle D of RCRA. Under the Subtitle D requirements, EPA established minimum technical requirements for solid waste disposal facilities and created a program under which participating states develop and implement solid waste management plans. Provisions for Federal financial and technical assistance to state and local jurisdictions were included to assist in the development of these plans. EPA expenditures are primarily for these plans, recycling programs, and regulation development. A major problem occurs in estimating EPA expenditures for solid waste activities because all RCRA costs since 1981 have been reported in EPA budget documents as hazardous waste costs. A special analysis was used to separate out EPA expenditures for solid waste activities. This analysis is discussed in Appendix G.

EPA grants for state and local solid waste plans and recycling programs have historically been relatively modest, reaching a high of $114 million in 1980. EPA expenditures were much lower in recent years, accounting for only $3 million in 1987. Future EPA expenditures are expected to increase steadily through the remainder of the century. These costs are associated primarily with regulation development and implementation.

5.1.2. State Government

Before 1981, state funds for implementation of solid waste activities came primarily from Federal grants. In subsequent years, state solid waste spending were largely a function of the importance a particular state places on the problem of solid waste disposal. No estimates of these state costs are available; they are probably very low since solid waste planning and management have historically been the responsibility of local governments.

5.1.3. Local Government

Local governments have relatively high costs for the services associated with the collection and disposal of solid waste, and compliance with Federal standards for solid waste disposal facilities. Local solid waste costs rose steadily from $3.5 billion in 1972 to about $6.3 billion in 1987. Future costs are expected to rise more dramatically as more stringent Subtitle D requirements for solid waste disposal facilities come into effect. The new Subtitle D standards are expected to impose a little more than $1.5 billion in annualized costs to local governments by the year 2000. Total future costs to localities for solid waste disposal are estimated to increase steadily to approximately $9.5 billion by the year 2000.

5.1.4. Private

Private solid waste expenditures are also for compliance with standards for solid waste disposal facilities and for solid waste collection and disposal services. Private solid waste costs increased steadily from an estimated $4.8 billion in 1972 to $10 billion in 1987. Private costs are projected to increase slightly in the future, reaching an estimated $11.7 billion by the year 2000.

5.2. HAZARDOUS WASTES

Federal expenditures to administer a national hazardous waste management program and private costs to comply with EPA and state regulations constitute the majority of all hazardous waste expenditures under RCRA. Generally, EPA grants drive state expenditures for administration of permitting and enforcement programs. Local government expenditures are primarily associated with the siting of hazardous waste treatment facilities.

Annualized costs for all sectors increased dramatically from $182 million in 1981 (the year in which costs were first recorded) to $1.7 billion in 1987. This trend is expected to continue into the future, driven in large part by several new and forthcoming regulations, most notably rules restricting the land disposal of hazardous wastes and mandating corrective action at solid waste disposal facilities. These new regulations are expected to add an additional $4.6 billion in annualized private sector costs by the year 2000. Future annual costs for all hazardous waste programs are projected to increase to $9.2 billion in 1995, and to $12 billion by the year 2000.

5.2.1. EPA and Non-EPA Federal

Much of EPA's spending prior to 1982 was for program development, definition of wastes and activities to be regulated, development of permitting programs for waste handlers, and the establishment of procedures to transfer program administration to the states. Implementation began in 1982 after EPA developed compliance monitoring and enforcement regulations and began technical reviews of permit applications.

The Hazardous and Solid Waste Amendments of 1984 (HSWA) significantly enhanced EPA's regulatory activities under RCRA. The Act authorized a program to regulate underground storage tanks and directed EPA to develop standards to regulate carcinogenic, mutagenic, or other toxic waste materials that had escaped regulation in earlier years. HSWA also directed EPA to promulgate corrective action rules mandating the clean-up of operating and closing waste management facilities. In addition, EPA was to develop regulations to restrict the land disposal of hazardous waste. EPA costs for these activities increased from $147 million in 1982 to $240 million in 1987. Future EPA implementation costs are expected to increase slightly over time.

Non-EPA Federal agencies such as the Departments of Energy and Defense maintain facilities that are subject to regulations pursuant to RCRA Subtitle C. These agencies currently incur compliance costs which are expected to increase significantly over the next several years. The only data available on such expenditures are actual budget appropriations data for recent years and estimates of budget needs over the next few years for the Departments of Energy and Defense, which together account for the large majority of expected Federal expenditures. This data was broken into capital and O&M cost components using rules of thumb discussed in Appendix H. The resulting estimates, on an annualized basis, indicate that Federal spending for compliance with RCRA was $258 million in 1989, and is expected to increase dramatically to over $2 billion by the year 1995, and to $3.5 billion by the year 2000. These estimates are documented in Appendix H.

5.2.2. State Government

Federal grants support the majority of state hazardous waste expenditures for reporting, permitting, and enforcement. States can be authorized to implement RCRA only if their programs are substantially the same as, or more stringent than, the Federal program. State funds are also derived from dedicated gasoline taxes and fees and used to finance special programs such as hazardous waste facility planning/siting. While some state programs stand out for their scope and funding—California's, for example—overall, state administrative expenditures are relatively small and compliance expenditures are negligible. State costs are not included in this report.

5.2.3. Local Government

Overall, local government spending to implement or comply with RCRA and HSWA hazardous waste is negligible. Such spending is primarily to support the program planning and siting of hazardous waste treatment, storage and disposal facilities. Local costs are not included in this report.

5.2.4. Private

Private expenditures to comply with RCRA hazardous waste regulations increased steadily since 1983, in line with the gradual regulation of an increasing number of waste streams, groups of hazardous waste generators, and management technologies. On an annualized basis, private costs increased from $539 million in 1983 to $1.4 billion in 1987. Private expenditures are expected to increase substantially throughout the 1990s as additional HSWA regulations take effect. Private costs to comply with new and existing regulations are projected to increase to an estimated $6.8 billion in 1995, and to $8.2 billion by the year 2000.

Of the new and soon-to-be implemented hazardous waste regulations, the most costly to the private sector is the corrective action rule for solid waste management units (SWMUs). This rule, which was proposed in 1990, will set technical standards and procedures for conducting corrective action on groundwater, soil, air and surface water caused by significant releases from SWMUs at operating, closed, or closing RCRA facilities. The rule will require any facility seeking a RCRA permit or closing SWMUs under interim status to undergo a Remedial Feasibility Assessment to determine whether any SWMU is the source of hazardous waste releases. If a leaking SWMU is identified, the owner/operator of the facility will be required to perform a Remedial Feasibility Investigation to assess the extent of the problem and perform the needed corrective action. Annualized private costs for corrective action are expected to be about $1.3 billion in 1993, increasing to $1.8 billion in 1997, and to $2.2 billion in the year 2000.

5.3. LEAKING UNDERGROUND STORAGE TANKS

The recently promulgated technical standards and financial responsibility requirements for petroleum-containing underground storage tanks (UST) are expected to impose significant compliance costs on the private sector. The rules impose a much lower level of costs on government entities, however. The technical standards rule, which took effect in 1989, requires the retirement, upgrade, or replacement within ten years of all tanks that do not meet the new tank standards, as well as the installation of leak detection monitors. In addition, the rule requires corrective action for contamination caused by tank releases. The financial responsibility rule requires tank owners/operators to demonstrate the financial capability to take prompt corrective action for contamination caused by tank releases, and to provide compensation to third parties harmed by any release. The costs of the financial responsibility rule are minimal compared to costs for the technical standards rule. Together, the new rules are expected to result in annualized costs of about $3.2 billion in 1990, increasing to an estimated $4.6 billion by the year 1993. These costs are driven primarily by corrective action activities over the years 1989-1993. Annualized costs are expected to drop off to approximately $3 billion over the next few years, and then jump to $3.8 billion in 1998, the compliance deadline year for tank upgrade/replacement.

5.3.1. EPA and Non-EPA Federal

The EPA administers the Leaking Underground Storage Tank Trust Fund (LUST Fund) to assist states in the development of programs to respond to releases from petroleum-containing underground tanks. Private companies have a large financing role; the LUST Fund is capitalized from taxes on private companies. (LUST Fund expenditures, however, are treated here as costs to EPA). EPA expenditures for years 1987 and 1988 are based on actual EPA appropriations from the LUST Fund. EPA costs for years 1989-2000 are based on projections from 1987 and 1988 levels. EPA costs were $13 million in 1988, and are expected to increase to $81 million in 1995, and to $130 million by the year 2000.

Non-EPA Federal agencies will incur compliance costs associated with the new UST regulations. These costs are included in the non-EPA Federal costs estimates given for hazardous waste because they could not be separated out.

5.3.2. Local Governments

Local annualized costs of compliance with the UST rules are expected to be relatively low, increasing from about $118 million in 1989 to $359 million in 1993. Costs are then expected to drop to less than $300 million per year through the year 2000.

5.3.3. Private

Private expenditures to comply with the new technical standards and financial responsibility requirements for petroleum-containing underground storage tanks are relatively high. Private annualized compliance costs are estimated to increase from about $1.1 billion in 1989 to $4.2

billion by 1993. These costs are driven primarily by large expenditures for corrective action in each of the years 1989-1993. Annualized costs are expected to fall to about $2.7 billion in subsequent years and then jump to $3.6 billion in 1998, the compliance deadline for tank upgrade/replacement.

5.4. TOTAL RCRA

Prior to 1981, all expenditures associated with RCRA-related pollution control programs were for the collection and disposal of solid waste, and for compliance with solid waste facility standards. These costs ranged from an estimated $8.4 billion in 1972 to $13.6 billion in 1980. Roughly 60 percent of these costs were borne by the private sector, and most of the remainder by local governments. Expenditures for hazardous waste programs began in the early 1980s, and increased steadily throughout the decade. By 1988, hazardous waste control costs were $3 billion, while solid waste costs were about $16.3 billion. In 1990, total RCRA-related costs are expected to be roughly $25 billion, increasing to $32.5 billion in 1995, and to $38 billion by the year 2000. In the 1990s, costs for hazardous waste programs are expected to rise significantly and account for an increasing share of all RCRA-related pollution control expenditures.

If only Federally-mandated programs are considered (*i.e.*, excluding solid waste collection and disposal services), annualized costs will reach an estimated $8.8 billion in 1990, increasing to $15 billion in 1995, and to $19.3 billion by the year 2000. Hazardous waste control costs (including UST control), are expected to account for over 80 percent of these costs throughout the 1990s. This large share of costs accounted for by hazardous waste programs is driven primarily by several new and forthcoming regulations, including the corrective action rule for solid waste management units, the UST technical standards rule, and several rules restricting the land disposal of hazardous wastes.

5.5. SUPERFUND

EPA has a major role as administrator of the Superfund Program, as authorized under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986. EPA uses funds from the CERCLA Trust Fund (which is financed primarily by taxes on private industry) for program administration as well as for site clean-ups. Private sector expenditures for site clean-ups come from the parties identified as responsible for waste sites. Non-EPA Federal expenditures are associated with site investigation and clean-up activities primarily by the Department of Energy and the Department of Defense. The 1986 Amendments to CERCLA gave states an important role in evaluating and planning remedial actions at Superfund sites, and responsibility for a small portion of total operation and maintenance costs at sites relying on Trust Fund monies for clean-up. Local governments generally play a minor role in implementation of the Superfund Program.

On an annualized basis, total costs for Superfund implementation and compliance were relatively modest throughout much of the 1980s, increasing from $15 million in 1981 to $400 million in 1986. Costs jumped significantly after SARA was enacted, however, reaching an estimated $683 million in 1987 and $1.3 billion in 1989. Future costs are expected to continue this trend, reaching an estimated $3.4 billion in 1993, $6 billion in 1997, and over $8 billion by the year 2000.

5.5.1. EPA and Non-EPA Federal

EPA expenditures for administration of the Superfund Program include site investigations, development of a priority site clean-up list, planning and conducting clean-ups, coordinating a national program of immediate removals in response to chemical spills and other releases of toxic substances into the environment, and enforcement actions. Monies for these activities come from the CERCLA Trust Fund. Prior to 1986, the Fund was financed primarily by taxes on chemical and petroleum feedstocks. Additional money came from interest earned on the balance in the Fund, fines and recoveries from responsible parties, and appropriations from general revenues. The 1986 Amendments to CERCLA (SARA) broadened the revenue base. Beginning in 1987, the Fund was financed by a tax on domestic and imported crude oil, the original tax on petroleum and chemical feedstocks, and a new tax on manufacturing industries nationwide. All expenditures from the Fund are treated here as costs to EPA.

EPA Superfund costs, on an annualized basis, increased steadily throughout the 1980s, reaching an estimated $740 million in 1989. EPA Superfund costs are estimated to continue this trend throughout the 1990s, increasing from $852 million in 1990 to $1.6 billion in 1995, and to $2.6 billion by the year 2000. (Detailed documentation for CERCLA remediation costs to all affected sectors is provided in Appendix H.)

Non-EPA Federal agencies—primarily the Departments of Energy and Defense—face significant responsibilities under CERCLA for clean-up of hazardous waste and nuclear facilities and sites that are no longer under active operations. Estimates of the annualized costs for these responsibilities are substantial, increasing from an estimated $107 million in 1987 to $396 million in 1990. Future non-EPA Federal costs are expected to rise dramatically, reaching $1.7 billion in 1995 and $2.8 billion by the year 2000.

5.5.2. State Governments

States are authorized to impose their own standards on Superfund-financed clean-ups. They must finance the marginal costs associated with stricter standards, however. States have the right to participate in preliminary assessments, site inspection, and hazard ranking as well as to review and comment on clean-up plans and to participate in negotiations for repayment from potentially responsible private parties. Beyond initial studies and investigations, states are required to match Federal funds for remedial action with a ten percent contribution (50 percent if the site is owned by state or local government) and to take responsibility for all future operating and maintenance costs not involving surface water and groundwater restoration. These requirements are expected to result in annualized costs to states of about $140 million in 1990, $379 million in 1995, and $727 million by the year 2000.

State involvement in the Superfund Program has varied. Many states with a large number of uncontrolled sites have established means to raise large sums of money for site clean-up as well as to develop their own Superfund Programs (*e.g.*, New York, California, New Jersey, and Illinois). The total costs associated with these state programs are not known, and no estimates for them are included in this report.

5.5.3. Private

Private expenditures for Superfund remediation activities are an important percentage of the total. The major private costs associated with Superfund are "Responsible Party" contributions for site investigation and clean-ups. (Although taxes paid into the CERCLA Trust Fund are largely costs to the private sector, they are treated as EPA expenditures in this report.)

Private annualized costs in years prior to 1987 were relatively modest, reaching an estimated $57 million in 1986. Future private costs are expected to rise significantly, increasing to $950 in 1995 and to $1.8 billion by the year 2000. In addition to site investigation and clean-up costs, private companies are spending large sums to contest liability in court. A recent *Wall Street Journal* article estimated that private companies are spending millions of dollars to prove that their insurance companies or other firms are liable for Superfund cleanups.[1] These costs are not included in this report.

5.6. TOTAL LAND POLLUTION CONTROL COSTS

Total annualized costs associated with land pollution control, including costs for solid waste collection and disposal services, increased steadily from approximately $8.4 billion in 1972 to $19 billion in 1987. Future costs are expected to rise dramatically, due primarily to new and forthcoming hazardous waste and UST regulations, and increased levels of activity under Superfund. Land pollution control costs are expected to be $25.6 billion in 1990, increasing to $37 billion by 1995, and to $46 billion by the year 2000. Hazardous waste, UST and Superfund are expected to account for 35 percent of these costs by 1990, 43 percent by 1995, and by more than 50 percent by the year 2000.

When only Federally-mandated land pollution control programs are considered, however, (*i.e.*, excluding solid waste collection and disposal services), total land pollution control costs are significantly lower, and hazardous waste costs account for a large majority of the estimated future costs. Total annualized expenditures for Federally-mandated programs were less than $500 million in 1972 and about $910 million in 1980. Since 1980 these costs have increased dramatically, reaching $3.5 billion in 1987. This trend is projected to continue into the future: costs for Federally-mandated programs are estimated to reach $10.5 billion in 1990, $19.7 billion in 1995, and over $27 billion by the year 2000. Hazardous waste, UST, and Superfund programs are expected to account for more than 85 percent of the future annualized costs of Federally-mandated land pollution control programs.

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[1] Amal Kuman Naj, "Can $100 Billion Have 'No Material Effect' on Balance Sheets?", *Wall Street Journal*, May 11, 1988.

Table 5-1: LAND POLLUTION CONTROL CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.1	Solid Waste															
	Existing Regulations															
	EPA															
	Non-EPA Federal			56	53	42	24	34	23	25	29	19	52	121	119	105
	State Government															
	Local Government	613	620	634	652	646	668	702	713	725	731	741	753	756	849	984
	Private	733	911	980	847	887	980	963	1,126	1,157	1,140	941	786	971	943	1,025
	Total Solid Waste	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,591	1,848	1,912	2,115
	Federally Mandated	67	77	137	128	119	106	117	115	119	123	103	129	207	209	205
5.2	Hazardous Waste															
	Existing Regulations															
	EPA															
	Non-EPA Federal													20	34	52
	State Government															
	Local Government															
	Private												65	93	334	169
	Total Hazardous Waste												65	113	368	558
	Federally Mandated												65	113	368	558
5.3	LUST															
	Existing Regulations															
	EPA															
	Non-EPA Federal															
	State Government															
	Local Government															
	Private															
	Total LUST															
	Federally Mandated															
5.4	Total RCRA	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,656	1,961	2,280	2,672
	Federally Mandated	67	77	137	128	119	106	117	115	119	123	103	193	320	577	763
5.5	Superfund															
	Existing Regulations															
	EPA										38	171	195	389	396	293
	Non-EPA Federal													77	158	209
	State Government										4	19	22	43	44	33
	Local Government															
	Private											3	76	139	150	178
	Total Superfund										42	193	293	648	748	713
	Federally Mandated										42	193	293	648	748	713
5.6	Total Land	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,942	1,893	1,949	2,609	3,028	3,385
	Federally Mandated	67	77	137	128	119	106	117	115	119	165	296	486	968	1,325	1,476

Footnotes to Table 5-1

SOLID WASTE

EPA: Assumed to be zero; EPA solid waste costs are assumed to be operating costs.

Non-EPA Federal: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Local Government: From Appendix G, Table G-4. See Appendix G for detail.

Private: From Appendix G, Table G-4. See Appendix G for detail.

Existing Federally Mandated: Assumed to be 100 percent of total costs for solid waste regulations.

Total Federally Mandated: Sum of total outlays for solid waste regulations.

HAZARDOUS WASTE

Private: Private manufacturing capital expenditures for pollution abatement are from the 1983-1986 annual editions of "Pollution Abatement Costs and Expenditures" published by the Bureau of the Census. Figures exclude manufacturing establishments with less than 20 employees. If adjusted to include those establishments with less than 20 employees, it is estimated that these numbers would be increased by approximately 2 percent or less.

Federally Mandated: Assumed to be 100 percent of total costs for hazardous waste regulations.

Total Federally Mandated: Sum of total outlays for hazardous waste regulations.

SUPERFUND

EPA, State Government, Private: Estimated on the basis of Appendix H.

Federally Mandated: Assumed to be 100 percent of total costs for Superfund regulations.

Total Federally Mandated: Sum of total outlays for Superfund regulations.

Table 5-1A: RCRA CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.1	**Solid Waste**															
	Existing Regulations															
	EPA															
	Non-EPA Federal	105	149	170	192	213	235	256	277	299	320	342	363	384	406	427
	State Government															
	Local Government	984	1,018	930	952	975	997	1,020	1,042	1,065	1,088	1,110	1,133	1,155	1,178	1,200
	Private	1,025	1,002	883	854	824	795	766	736	707	677	648	618	589	559	530
	Total Existing Regs	2,115	2,169	1,983	1,998	2,012	2,027	2,041	2,056	2,070	2,085	2,099	2,114	2,128	2,143	2,157
	Federally Mandated	205	250	261	282	303	324	345	366	387	408	430	451	472	493	514
	New Regulations															
	Local Government						2,105	2,105	877	877	877	877	877	877	877	877
	Private							502	502	502	502					
	Total New Regs						2,105	2,607	1,379	1,379	1,379	877	877	877	877	877
	Total Solid Waste	2,115	2,169	1,983	1,998	2,012	4,132	4,648	3,435	3,449	3,464	2,976	2,991	3,005	3,020	3,034
	Federally Mandated	205	250	261	282	303	2,429	2,952	1,745	1,766	1,787	1,307	1,328	1,349	1,370	1,391
5.2	**Hazardous Waste**															
	Existing Regulations															
	EPA															
	Non-EPA Federal	52	69	75	865	1,081	1,429	3,040	3,192	3,427	3,114	2,970	2,970	2,970	2,970	2,970
	State Government															
	Local Government															
	Private	169	303	359	414	469	525	580	635	691	746	802	857	912	968	1,023
	Total Existing Regs	221	372	434	1,279	1,550	1,954	3,620	3,827	4,118	3,860	3,772	3,827	3,882	3,938	3,993
	Federally Mandated	221	372	434	1,279	1,550	1,954	3,620	3,827	4,118	3,860	3,772	3,827	3,882	3,938	3,993
	New Regulations															
	Private	337	130	1,338	1,170	1,379	391	382	125	411	221	450	904	210	216	222
	Total New Regs	337	130	1,338	1,170	1,379	391	382	125	411	221	450	904	210	216	222
	Total Hazardous Waste	558	502	1,772	2,449	2,929	2,345	4,002	3,952	4,529	4,081	4,222	4,731	4,092	4,154	4,215
	Federally Mandated	558	502	1,772	2,449	2,929	2,345	4,002	3,952	4,529	4,081	4,222	4,731	4,092	4,154	4,215
5.3	**LUST**															
	Total Existing Regs															
	New Regulations															
	Local Government				473	473	514	473	473	23	23	23	23	602	5	5
	Private				4,777	4,777	5,583	4,777	4,777	433	433	433	433	11,153	95	95
	Total New Regs				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
	Total LUST				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
	Federally Mandated				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
5.4	**Total RCRA**	2,672	2,671	3,755	9,697	10,192	12,574	13,901	12,637	8,434	8,001	7,654	8,178	18,853	7,273	7,349
	Federally Mandated	763	752	2,033	7,981	8,483	10,871	12,204	10,948	6,751	6,325	5,984	6,514	17,196	5,623	5,706

Footnotes to Table 5-1A

SOLID WASTE

EPA: Assumed to be zero; EPA solid waste costs are assumed to be operating costs.

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing Local Government: 1986 and 1987 figures from Appendix G, Table G-4. See Appendix G for detail. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Private: 1986 and 1987 figures from Appendix G, Table G-4. See Appendix G for detail. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Existing Federally Mandated: Assumed to be 100 percent of total costs for solid waste regulations.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total outlays for total existing solid waste regulations and total new regulations.

HAZARDOUS WASTE

Non-EPA Federal: Estimated cost of Federal facility compliance from Appendix H, Table H-2.

Existing Private: 1986 data for private manufacturing capital expenditure for pollution abatement from the 1986 edition of "Pollution Abatement Costs and Expenditures" published by the Bureau of the Census. Linear projection of expenditures for 1987-2000 based on historical data for the years 1983-1986. Figures exclude manufacturing establishments with less than 20 employees. If adjusted to include those establishments with less than 20 employees, it is estimated that these numbers would be increased by approximately 2 percent or less.

Existing Federally Mandated: Assumed to be 100 percent of total costs for hazardous waste regulations.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total costs for existing hazardous waste regulations and new regulations.

LUST

Existing Federally Mandated: Assumed to be 100 percent of total costs of regulations associated with LUST.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total costs of existing LUST regulations and new regulations.

Table 5-1B: CERCLA CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.5	Superfund															
	Existing Regulations															
	EPA	293	760	1,077	995	905	1,155	1,270	1,385	1,501	1,616	1,731	1,846	1,961	2,076	2,191
	Non-EPA Federal	209	276	300	801	970	1,302	2,381	2,756	2,876	2,962	2,797	2,797	2,797	2,797	2,797
	State Government	33	84	120	111	101	128	141	154	167	180	192	205	218	231	243
	Local Government															
	Private	178	342	401	874	879	983	1,103	1,205	1,325	1,429	1,546	1,654	1,770	1,874	1,992
	Total Existing Regs	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
	Federally Mandated	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
	New Regulations															
	Local Government															
	Private															
	Total New Regs															
	Full Implementation															
	Total Superfund	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
	Federally Mandated	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
5.6	Total Land	3,385	4,133	5,653	12,478	13,047	16,142	18,796	18,137	14,303	14,188	13,920	14,680	25,599	14,251	14,572
	Federally Mandated	1,476	2,214	3,931	10,762	11,338	14,439	17,099	16,448	12,620	12,512	12,250	13,016	23,942	12,601	12,929

Footnotes to Table 5-1B

EPA, State Government, Private: Estimated on the basis of Appendix H and the regulations and sources listed in Appendix A.

Non-EPA Federal: Estimated cost of Federal facility compliance from Appendix H, Table H-2.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with Superfund regulations.

Total Federally Mandated: Sum of total costs associated with existing and new Superfund regulations.

Table 5-2: LAND POLLUTION CONTROL OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.1	Solid Waste															
	Existing Regulations															
	EPA	70	72	20	24	36	36	39	99	114	19				2	3
	Non-EPA Federal			80	109	105	101	94	103	103	152	179	181	185	239	202
	State Government															
	Local Government	3,473	3,512	3,592	3,694	3,661	3,783	3,976	4,042	4,106	4,144	4,196	4,270	4,510	4,786	5,038
	Private	4,766	5,042	5,228	5,388	5,862	6,528	6,769	7,519	7,891	8,042	6,885	6,497	7,135	7,317	8,011
	Total Solid Waste	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,356	11,260	10,947	11,830	12,344	13,254
	Federally Mandated	482	499	541	587	617	653	671	780	816	780	733	719	767	846	857
5.2	Hazardous Waste															
	Existing Regulations															
	EPA										182	147	144	146	155	202
	Non-EPA Federal													4	6	9
	State Government															
	Local Government															
	Private												533	678	796	928
	Total Hazardous Waste										182	147	677	828	958	1,306
	Federally Mandated										182	147	677	828	958	1,306
5.3	LUST															
	Existing Regulations															
	EPA															
	Non-EPA Federal															
	State Government															
	Local Government															
	Private															
	Total LUST															
	Federally Mandated															
5.4	Total RCRA	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,538	11,407	11,624	12,658	13,301	14,561
	Federally Mandated	482	499	541	587	617	653	671	780	816	962	880	1,396	1,596	1,804	2,164
5.5	Superfund															
	Existing Regulations															
	EPA										12	36	60	105	100	114
	Non-EPA Federal													14	28	37
	State Government											4	8	16	20	27
	Local Government															
	Private												1	5	9	13
	Total Superfund										12	40	69	140	157	191
	Federally Mandated										12	40	69	140	157	191
5.6	Total Land	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,550	11,447	11,693	12,798	13,458	14,752
	Federally Mandated	482	499	541	587	617	653	671	780	816	974	920	1,465	1,736	1,961	2,355

Footnotes to Table 5-2

SOLID WASTE

EPA: Data for 1972-1980 from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays). Beginning in 1981 all EPA operating expenditures for solid waste management were included in the category "Hazardous Waste". The Office of Solid Waste, however, provided estimated proportions of hazardous waste which are actually for solid waste for the years 1981-1988. Extrapolations were then made for 1989 and 1990 based on proportions for 1984-1988. See Appendix G for details.

Non-EPA Federal: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Local Government: From Appendix G, Table G-4. See Appendix G for detail.

Private: From Appendix G, Table G-4. See Appendix G for detail.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with existing regulations for solid waste pollution control.

Total Federally Mandated: Sum of total costs associated with regulations for solid waste pollution control.

HAZARDOUS WASTE

EPA: Data for 1972-1980 from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays). Beginning in 1981 all EPA operating expenditures for solid waste management were included in the category "Hazardous Waste". The Office of Solid Waste, however, provided estimated proportions of hazardous waste which are actually for solid waste for the years 1981-1988. Extrapolations were then made for 1989 and 1990 based on proportions for 1984-1988. See Appendix G for details.

Private: Private manufacturing capital expenditures for pollution abatement are from the 1983-1986 annual editions of "Pollution Abatement Costs and Expenditures" published by the Bureau of the Census. Figures exclude manufacturing establishments with less than 20 employees. If adjusted to include those establishments with less than 20 employees, it is estimated that these numbers would be increased by approximately 2 percent or less.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with existing regulations for hazardous waste pollution control.

Total Federally Mandated: Sum of total costs associated with regulations for hazardous waste pollution control.

SUPERFUND

EPA, State Government, Private: Estimated on the basis of Appendix H.

Existing Federally Mandated: Assumed to be 100 percent of total costs of existing regulations associated with Superfund.

Total Federally Mandated: Sum of total costs of regulations associated with Superfund.

Table 5-2A: RCRA OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.1	Solid Waste															
	Existing Regulations															
	EPA	3	3	6	9	12	14	16	18	20	22	24	26	28	30	32
	Non-EPA Federal	202	233	245	258	270	283	295	307	320	332	345	357	369	382	394
	Local Government	5,038	5,194	5,036	5,144	5,251	5,358	5,466	5,573	5,680	5,788	5,895	6,003	6,110	6,217	6,325
	Private	8,011	8,605	8,175	8,327	8,479	8,630	8,782	8,934	9,086	9,237	9,389	9,541	9,692	9,844	9,996
	Total Existing Regs	13,254	14,035	13,463	13,738	14,012	14,286	14,559	14,832	15,106	15,379	15,653	15,926	16,200	16,473	16,747
	Federally Mandated	857	926	912	941	969	996	1,023	1,051	1,078	1,105	1,133	1,160	1,188	1,215	1,242
	New Regulations															
	Local Government						196	196	318	439	439	439	439	439	439	439
	Private							77	77	77	77	77	77	77	77	77
	Total New Regs						196	273	395	516	516	516	516	516	516	516
	Total Solid Waste	13,254	14,035	13,463	13,738	14,012	14,482	14,832	15,227	15,622	15,895	16,169	16,442	16,716	16,989	17,263
	Federally Mandated	857	926	912	941	969	1,192	1,296	1,446	1,594	1,621	1,649	1,676	1,704	1,731	1,758
5.2	Hazardous Waste															
	Existing Regulations															
	EPA	202	239	231	214	210	236	245	254	263	272	281	290	299	308	317
	Non-EPA Federal	9	13	14	153	191	252	536	563	605	550	524	524	524	524	524
	State Government															
	Local Government															
	Private	928	1,060	1,190	1,321	1,451	1,582	1,712	1,842	1,973	2,103	2,234	2,364	2,495	2,625	2,755
	Total Existing Regs	1,139	1,312	1,435	1,688	1,853	2,070	2,493	2,660	2,841	2,926	3,039	3,178	3,318	3,457	3,597
	Federally Mandated	1,139	1,312	1,435	1,688	1,853	2,070	2,493	2,660	2,841	2,926	3,039	3,178	3,318	3,457	3,597
	New Regulations															
	EPA		3	3	3	3	3	3	3	3	3	3	3	3	3	3
	State Government		9	9	9	9	9	9	9	5	5	5	5	5	5	5
	Private	167	250	1,311	1,343	1,711	2,698	3,285	3,405	3,541	3,665	3,339	3,490	3,614	3,738	3,825
	Total New Regs	167	262	1,323	1,355	1,723	2,710	3,297	3,417	3,549	3,673	3,347	3,498	3,622	3,746	3,833
	Total Hazardous Waste	1,306	1,574	2,758	3,043	3,576	4,780	5,790	6,077	6,390	6,599	6,386	6,676	6,940	7,203	7,430
	Federally Mandated	1,306	1,574	2,758	3,043	3,576	4,780	5,790	6,077	6,390	6,599	6,386	6,676	6,940	7,203	7,430
5.3	LUST															
	Existing Regulations															
	EPA		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Total Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Federally Mandated		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	New Regulations															
	Local Government				80	156	156	165	165	57	30	30	30	30	14	14
	Private				778	2,132	2,182	2,199	2,200	937	551	551	552	553	253	253
	Total New Regs				858	2,338	2,338	2,364	2,365	994	581	581	582	583	267	267
	Total LUST		1	13	888	2,368	2,379	2,416	2,427	1,066	662	672	683	694	387	397
	Federally Mandated		1	13	888	2,368	2,379	2,416	2,427	1,066	662	672	683	694	387	397
5.4	Total RCRA	14,561	15,610	16,234	17,668	19,956	21,640	23,038	23,731	23,077	23,156	23,227	23,801	24,349	24,580	25,090
	Federally Mandated	2,164	2,501	3,684	4,871	6,913	8,351	9,503	9,949	9,050	8,882	8,707	9,035	9,337	9,321	9,585

Footnotes to Table 5-2A

SOLID WASTE

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Beginning in 1981 all EPA operating expenditures for solid waste management were included in the category "Hazardous Waste". The Office of Solid Waste, however, provided estimated proportions of hazardous waste which are actually for solid waste for the years 1981-1988. Extrapolations were then made for 1989 and 1990 based on proportions for 1984-1988. See Appendix G for details. Linear projection of expenditures for 1991-2000 based on derived data for the years 1984-1990.

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing Local Government: 1986 and 1987 figures from Appendix G, Table G-4. See Appendix G for detail. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Private: 1986 and 1987 figures from Appendix G, Table G-4. See Appendix G for detail. Linear projection of expenditures for 1988-2000 based on historical data for the years 1972-1987.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with existing regulations for solid waste pollution control.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total costs associated with existing and new regulations for solid waste pollution control.

HAZARDOUS WASTE

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Beginning in 1981 all EPA operating expenditures for solid waste management were included in the category "Hazardous Waste". The Office of Solid Waste, however, provided estimated proportions of hazardous waste which are actually for solid waste for the years 1981-1988. Extrapolations were then made for 1989 and 1990 based on proportions for 1984-1988. See Appendix G for details. Linear projection of expenditures for 1991-2000 based on derived data for the years 1981-1990.

Non-EPA Federal: Estimated cost of Federal facility compliance from Appendix H, Table H-2.

Existing Private: 1986 private manufacturing capital expenditure for pollution abatement from the 1986 edition of "Pollution Abatement Costs and Expenditures" published by the Bureau of the Census. Linear projection of expenditures for 1987-2000 based on historical data for the years 1983-1986. Figures exclude manufacturing establishments with less than 20 employees. If adjusted to include those establishments with less than 20 employees, it is estimated that these numbers would be increased by approximately 2 percent or less.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with regulations for hazardous waste pollution control.

New State Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total costs associated with existing and new regulations for hazardous waste pollution control.

LUST

EPA: Data for 1987-1990 from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on data for the years 1987-1990.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with existing regulations for LUST.

New Non-EPA Federal: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total costs associated with existing and new regulations for LUST.

Table 5-2B: CERCLA OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.5	Superfund															
	Existing Regulations															
	EPA	114	255	320	392	431	450	499	548	596	645	693	742	791	839	888
	Non-EPA Federal	37	49	53	131	171	230	421	487	506	523	494	494	494	494	494
	State Government	27	28	44	67	93	123	154	189	228	270	315	364	416	471	530
	Local Government															
	Private	13	21	30	51	72	96	123	152	184	218	255	295	337	382	430
	Total Existing Regs	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
	Federally Mandated	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
	New Regulations															
	Local Government															
	Private															
	Total New Regs															
	Full Implementation															
	Total Superfund	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
	Federally Mandated	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
5.6	Total Land	14,752	15,963	16,681	18,309	20,723	22,539	24,235	25,107	24,591	24,812	24,984	25,696	26,387	26,766	27,432
	Federally Mandated	2,355	2,854	4,131	5,512	7,680	9,250	10,700	11,325	10,564	10,538	10,464	10,930	11,375	11,507	11,927

Footnotes to Table 5-2B

EPA, State Government, Private: Estimated on the basis of Appendix H and the regulations and sources listed in Appendix A.

Non-EPA Federal: Estimated cost of Federal facility compliance from Appendix H, Table H-2.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated existing Superfund regulations.

Total Federally Mandated: Sum of total costs associated with existing and new Superfund regulations.

Table 5-3: LAND POLLUTION CONTROL COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.1	Solid Waste															
	Existing Regulations															
	EPA	70	72	20	24	36	36	39	99	114	19				2	3
	Non-EPA Federal			85	119	119	118	114	125	127	179	208	215	230	295	268
	State Government															
	Local Government	3,530	3,629	3,768	3,931	3,960	4,144	4,404	4,538	4,669	4,777	4,899	5,043	5,355	5,711	6,056
	Private	4,835	5,197	5,475	5,716	6,274	7,032	7,363	8,220	8,701	8,959	7,892	7,577	8,307	8,579	9,369
	Total Solid Waste	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	13,934	12,998	12,835	13,892	14,587	15,697
	Federally Mandated	488	513	567	626	667	713	742	861	909	885	847	846	913	1,012	1,043
5.2	Hazardous Waste															
	Existing Regulations															
	EPA										182	147	144	146	155	202
	Non-EPA Federal													6	11	19
	Private												539	693	843	990
	Total Hazardous Waste										182	147	683	845	1,009	1,410
	Federally Mandated										182	147	683	845	1,009	1,410
5.3	LUST															
	Total LUST															
	Federally Mandated															
5.4	Total RCRA	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,116	13,145	13,518	14,737	15,596	17,107
	Federally Mandated	488	513	567	626	667	713	742	861	909	1,067	994	1,529	1,758	2,021	2,453
5.5	Superfund															
	Existing Regulations															
	EPA										15	53	93	169	196	233
	Non-EPA Federal													20	47	73
	State Government										0	6	12	23	31	40
	Local Government															
	Private											0	7	23	39	57
	Total Superfund										15	59	112	235	312	404
	Federally Mandated										15	59	112	235	312	404
5.6	Total Land	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,131	13,204	13,630	14,972	15,908	17,511
	Federally Mandated	488	513	567	626	667	713	742	861	909	1,082	1,053	1,640	1,993	2,333	2,856

Footnotes to Table 5-3

Sum of operating costs for year in question, shown on corresponding lines of Table 5-2, plus amortized capital costs assuming an interest rate of 7 percent and a capital life of 20 years for solid and hazardous waste and 30 years for LUST and Superfund on the accumulated capital investment shown in Table 5-1 since 1972.

Table 5-3A: RCRA COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.1	Solid Waste															
	Existing Regulations															
	EPA	3	3	6	9	12	14	16	18	20	22	24	26	28	30	32
	Non-EPA Federal	268	313	342	372	405	439	476	515	550	588	628	673	718	767	817
	Local Government	6,056	6,308	6,238	6,435	6,635	6,836	6,982	7,129	7,277	7,426	7,577	7,728	7,879	8,030	8,182
	Private	9,369	10,058	9,712	9,944	10,173	10,400	10,555	10,690	10,816	10,952	11,081	11,198	11,315	11,413	11,505
	Total Existing Regs	15,697	16,683	16,298	16,761	17,226	17,690	18,029	18,352	18,663	18,987	19,310	19,625	19,940	20,240	20,537
	Federally Mandated	1,043	1,135	1,146	1,201	1,258	1,316	1,369	1,423	1,474	1,528	1,585	1,645	1,706	1,769	1,834
	New Regulations															
	Local Government						395	593	798	1,002	1,085	1,168	1,250	1,333	1,416	1,499
	Private							124	172	219	267	267	267	267	267	267
	Total New Regs						395	718	970	1,221	1,351	1,434	1,517	1,600	1,682	1,765
	Total Solid Waste	15,697	16,683	16,298	16,761	17,226	18,085	18,747	19,322	19,884	20,338	20,744	21,142	21,539	21,922	22,302
	Federally Mandated	1,043	1,135	1,146	1,201	1,258	1,710	2,086	2,393	2,696	2,880	3,019	3,162	3,305	3,451	3,599
5.2	Hazardous Waste															
	Existing Regulations															
	EPA	202	239	231	214	210	236	245	254	263	272	281	290	299	308	317
	Non-EPA Federal	19	30	38	258	398	594	1,165	1,493	1,859	2,098	2,352	2,633	2,913	3,193	3,474
	State Government															
	Local Government															
	Private	990	1,151	1,315	1,485	1,659	1,839	2,024	2,215	2,411	2,611	2,817	3,029	3,245	3,467	3,694
	Total Existing Regs	1,212	1,419	1,583	1,957	2,268	2,670	3,435	3,963	4,533	4,982	5,451	5,952	6,457	6,968	7,485
	Federally Mandated	1,212	1,419	1,583	1,957	2,268	2,670	3,435	3,963	4,533	4,982	5,451	5,952	6,457	6,968	7,485
	New Regulations															
	EPA		3	3	3	3	3	3	3	3	3	3	3	3	3	3
	State Government		9	9	9	9	9	9	9	5	5	5	5	5	5	5
	Private	199	294	1,481	1,624	2,122	3,146	3,769	3,901	4,076	4,220	3,937	4,173	4,317	4,461	4,569
	Total New Regs	199	306	1,493	1,636	2,134	3,158	3,781	3,913	4,084	4,228	3,945	4,181	4,325	4,469	4,577
	Total Hazardous Waste	1,410	1,725	3,077	3,593	4,402	5,827	7,216	7,875	8,616	9,210	9,396	10,133	10,782	11,438	12,062
	Federally Mandated	1,410	1,725	3,077	3,593	4,402	5,827	7,216	7,875	8,616	9,210	9,396	10,133	10,782	11,438	12,062
5.3	LUST															
	Existing Regulations															
	EPA		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Total Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Federally Mandated		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	New Regulations															
	Non-EPA Federal															
	Local Government				118	232	274	321	359	253	228	229	231	280	264	265
	Private				1,163	2,952	3,402	3,804	4,190	2,962	2,611	2,645	2,681	3,581	3,289	3,296
	Total New Regs				1,281	3,184	3,675	4,125	4,549	3,214	2,838	2,875	2,913	3,861	3,553	3,561
	Total LUST		1	13	1,311	3,215	3,716	4,177	4,611	3,286	2,920	2,966	3,014	3,972	3,673	3,691
	Federally Mandated		1	13	1,311	3,215	3,716	4,177	4,611	3,286	2,920	2,966	3,014	3,972	3,673	3,691
5.4	Total RCRA	17,107	18,409	19,388	21,664	24,842	27,629	30,139	31,808	31,787	32,468	33,106	34,289	36,293	37,033	38,055
	Federally Mandated	2,453	2,861	4,236	6,104	8,874	11,254	13,479	14,879	14,598	15,009	15,381	16,308	18,059	18,563	19,352

Footnotes to Table 5-3A

Sum of operating costs for year in question, shown on corresponding lines of Table 5-2A, plus amortized capital costs assuming an interest rate of 7 percent and a capital life of 20 years for solid and hazardous waste and 30 years for LUST on the accumulated capital investment shown in Tables 5-1 and 5-1A since 1972.

Table 5-3B: CERCLA COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.5	Superfund															
	Existing Regulations															
	EPA	233	436	587	740	852	964	1,115	1,276	1,445	1,624	1,811	2,009	2,216	2,431	2,657
	Non-EPA Federal	73	107	135	278	396	560	943	1,231	1,482	1,737	1,934	2,159	2,384	2,610	2,835
	State Government	40	48	74	106	140	180	222	270	322	379	439	505	574	648	727
	Local Government															
	Private	57	93	134	225	317	420	536	662	801	950	1,112	1,285	1,470	1,666	1,874
	Total Existing Regs	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
	Federally Mandated	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
	New Regulations															
	Local Government															
	Private															
	Total New Regs															
	Full Implementation															
	Total Superfund	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
	Federally Mandated	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
5.6	Total Land	17,511	19,092	20,318	23,013	26,547	29,753	32,956	35,247	35,836	37,158	38,402	40,247	42,938	44,388	46,148
	Federally Mandated	2,856	3,545	5,166	7,452	10,579	13,378	16,295	18,318	18,648	19,699	20,677	22,266	24,704	25,918	27,445

Footnotes to Table 5-3B

Sum of the operating costs for the year in question, shown on corresponding lines of Table 5-2B, plus amortized capital costs assuming an interest rate of seven percent and a capital life of 30 years on the accumulated capital investment shown in Tables 5-1 and 5-1B since 1972.

Table 5-3C: LAND POLLUTION CONTROL COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.1	Solid Waste															
	Existing Regulations															
	EPA	70	72	20	24	36	36	39	99	114	19				2	3
	Non-EPA Federal			84	116	115	113	108	119	120	171	200	205	217	279	249
	State Government															
	Local Government	3,514	3,595	3,717	3,863	3,874	4,040	4,280	4,395	4,507	4,595	4,697	4,820	5,111	5,444	5,763
	Private	4,815	5,153	5,404	5,621	6,155	6,887	7,192	8,018	8,468	8,695	7,602	7,266	7,970	8,215	8,978
	Total Solid Waste	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,480	12,498	12,292	13,298	13,941	14,994
	Federally Mandated	486	509	559	615	653	695	721	838	883	855	814	809	871	964	989
5.2	Hazardous Waste															
	Existing Regulations															
	EPA										182	147	144	146	155	202
	Non-EPA Federal													5	10	16
	State Government															
	Local Government															
	Private												537	689	829	972
	Total Hazardous Waste										182	147	681	840	994	1,380
	Federally Mandated										182	147	681	840	994	1,380
5.3	LUST															
	Existing Regulations															
	EPA															
	Non-EPA Federal															
	State Government															
	Local Government															
	Private															
	Total LUST															
	Federally Mandated															
5.4	Total RCRA	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,662	12,645	12,973	14,139	14,935	16,374
	Federally Mandated	486	509	559	615	653	695	721	838	883	1,037	961	1,491	1,712	1,958	2,370
5.5	Superfund															
	Existing Regulations															
	EPA										14	47	81	145	161	190
	Non-EPA Federal													18	40	60
	State Government										0	5	10	20	27	35
	Local Government															
	Private											0	5	16	28	41
	Total Superfund										14	52	96	200	255	326
	Federally Mandated										14	52	96	200	255	326
5.6	Total Land	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,676	12,697	13,069	14,339	15,190	16,700
	Federally Mandated	486	509	559	615	653	695	721	838	883	1,051	1,013	1,586	1,912	2,214	2,695

Footnotes to Table 5-3C

Sum of operating costs for year in question, shown on corresponding lines of Table 5-2, plus amortized capital costs assuming an interest rate of three percent and a capital life of 20 years for solid and hazardous waste and 30 years for LUST and Superfund on the accumulated capital investment shown in Table 5-1 since 1972.

Table 5-3D: RCRA COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.1	Solid Waste															
	Existing Regulations															
	EPA	3	3	6	9	12	14	16	18	20	22	24	26	28	30	32
	Non-EPA Federal	249	290	314	339	366	394	424	455	484	514	547	582	618	656	695
	Local Government	5,763	5,987	5,892	6,063	6,236	6,411	6,546	6,681	6,818	6,954	7,093	7,232	7,369	7,508	7,647
	Private	8,978	9,640	9,269	9,478	9,685	9,891	10,045	10,185	10,318	10,458	10,594	10,721	10,848	10,961	11,071
	Total Existing Regs	14,994	15,920	15,482	15,890	16,300	16,710	17,030	17,338	17,639	17,948	18,257	18,560	18,863	19,155	19,446
	Federally Mandated	989	1,075	1,079	1,126	1,175	1,224	1,269	1,316	1,360	1,407	1,455	1,505	1,557	1,609	1,663
	New Regulations															
	Local Government						337	479	660	840	899	958	1,017	1,076	1,135	1,194
	Private							111	144	178	212	212	212	212	212	212
	Total New Regs						337	590	804	1,018	1,111	1,170	1,229	1,288	1,347	1,406
	Total Solid Waste	14,994	15,920	15,482	15,890	16,300	17,048	17,619	18,143	18,657	19,059	19,427	19,789	20,150	20,502	20,851
	Federally Mandated	989	1,075	1,079	1,126	1,175	1,561	1,859	2,120	2,378	2,517	2,625	2,734	2,844	2,956	3,069
5.2	Hazardous Waste															
	Existing Regulations															
	EPA	202	239	231	214	210	236	245	254	263	272	281	290	299	308	317
	Non-EPA Federal	16	25	31	228	339	496	984	1,226	1,498	1,652	1,826	2,025	2,225	2,425	2,624
	State Government															
	Local Government															
	Private	972	1,125	1,279	1,437	1,599	1,765	1,934	2,108	2,285	2,465	2,649	2,837	3,029	3,225	3,424
	Total Existing Regs	1,191	1,388	1,541	1,880	2,148	2,497	3,164	3,588	4,046	4,390	4,756	5,153	5,553	5,958	6,365
	Federally Mandated	1,191	1,388	1,541	1,880	2,148	2,497	3,164	3,588	4,046	4,390	4,756	5,153	5,553	5,958	6,365
	New Regulations															
	EPA		3	3	3	3	3	3	3	3	3	3	3	3	3	3
	State Government		9	9	9	9	9	9	9	5	5	5	5	5	5	5
	Private	190	281	1,432	1,543	2,004	3,017	3,630	3,758	3,922	4,060	3,765	3,977	4,115	4,253	4,355
	Total New Regs	190	293	1,444	1,555	2,016	3,029	3,642	3,770	3,930	4,068	3,773	3,985	4,123	4,261	4,363
	Total Hazardous Waste	1,380	1,681	2,985	3,435	4,164	5,526	6,805	7,358	7,975	8,458	8,529	9,138	9,676	10,219	10,728
	Federally Mandated	1,380	1,681	2,985	3,435	4,164	5,526	6,805	7,358	7,975	8,458	8,529	9,138	9,676	10,219	10,728
5.3	LUST															
	Existing Regulations															
	EPA		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Total Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Federally Mandated		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	New Regulations															
	Local Government				104	204	230	264	288	181	155	156	157	188	172	173
	Private				1,022	2,669	2,954	3,215	3,460	2,219	1,855	1,877	1,900	2,470	2,175	2,180
	Total New Regs				1,126	2,874	3,185	3,479	3,747	2,400	2,010	2,033	2,058	2,658	2,347	2,352
	Total LUST		1	13	1,155	2,904	3,226	3,531	3,809	2,471	2,091	2,124	2,158	2,769	2,468	2,483
	Federally Mandated		1	13	1,155	2,904	3,226	3,531	3,809	2,471	2,091	2,124	2,158	2,769	2,468	2,483
5.4	Total RCRA	16,374	17,603	18,480	20,480	23,369	25,799	27,956	29,310	29,104	29,609	30,080	31,085	32,595	33,188	34,062
	Federally Mandated	2,370	2,757	4,077	5,716	8,243	10,313	12,195	13,287	12,825	13,067	13,278	14,030	15,289	15,642	16,280

Footnotes to Table 5-3D

Sum of operating costs for year in question, shown on corresponding lines of Table 5-2A, plus amortized capital costs assuming an interest rate of 3 percent and a capital life of 20 years for solid and hazardous waste and 30 years for LUST on the accumulated capital investment shown in Tables 5-1 and 5-1A since 1972.

Table 5-3E: CERCLA COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.5	Superfund															
	Existing Regulations															
	EPA	190	369	489	612	697	775	889	1,009	1,133	1,265	1,401	1,544	1,693	1,847	2,008
	Non-EPA Federal	60	86	105	224	313	439	751	958	1,124	1,292	1,405	1,548	1,691	1,834	1,976
	State Government	35	41	63	91	123	159	197	240	288	339	394	453	516	583	654
	Local Government															
	Private	41	66	96	161	227	301	385	475	575	682	797	922	1,054	1,195	1,344
	Total Existing Regs	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
	Federally Mandated	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
	New Regulations															
	Local Government															
	Private															
	Total New Regs															
	Full Implementation															
	Total Superfund	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
	Federally Mandated	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
5.6	Total Land	16,700	18,165	19,233	21,569	24,729	27,474	30,178	31,992	32,223	33,186	34,078	35,552	37,550	38,647	40,045
	Federally Mandated	2,695	3,320	4,830	6,804	9,603	11,987	14,417	15,969	15,944	16,644	17,276	18,497	20,244	21,101	22,263

Footnotes to Table 5-3E

Sum of the operating costs for year in question, shown on corresponding lines of Table 5-2B, plus amortized capital costs assuming an interest rate of three percent and a capital life of 30 years on accumulated capital investment shown in Tables 5-1 and 5-1B since 1972.

Table 5-3F: LAND POLLUTION CONTROL COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.1	Solid Waste															
	Existing Regulations															
	EPA	70	72	20	24	36	36	39	99	114	19				2	3
	Non-EPA Federal			87	122	123	122	119	130	133	186	215	223	241	309	284
	State Government															
	Local Government	3,545	3,657	3,811	3,989	4,033	4,233	4,508	4,659	4,807	4,931	5,071	5,232	5,561	5,937	6,305
	Private	4,852	5,235	5,536	5,796	6,374	7,155	7,509	8,391	8,899	9,184	8,138	7,842	8,594	8,887	9,701
	Total Solid Waste	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,319	13,423	13,297	14,396	15,135	16,294
	Federally Mandated	490	516	573	635	679	727	759	881	932	910	875	877	949	1,052	1,088
5.2	Hazardous Waste															
	Existing Regulations															
	EPA										182	147	144	146	155	202
	Non-EPA Federal													6	12	21
	State Government															
	Local Government															
	Private												540	697	854	1,005
	Total Hazardous Waste										182	147	684	849	1,022	1,436
	Federally Mandated										182	147	684	849	1,022	1,436
5.3	LUST															
	Existing Regulations															
	EPA															
	Non-EPA Federal															
	State Government															
	Local Government															
	Private															
	Total LUST															
	Federally Mandated															
5.4	Total RCRA	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,502	13,570	13,981	15,246	16,156	17,730
	Federally Mandated	490	516	573	635	679	727	759	881	932	1,092	1,022	1,561	1,798	2,074	2,524
5.5	Superfund															
	Existing Regulations															
	EPA										16	58	103	189	226	271
	Non-EPA Federal													22	53	84
	State Government										0	6	13	25	34	45
	Local Government															
	Private											0	9	28	48	71
	Total Superfund										16	65	125	265	361	471
	Federally Mandated										16	65	125	265	361	471
5.6	Total Land	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,518	13,635	14,106	15,510	16,518	18,200
	Federally Mandated	490	516	573	635	679	727	759	881	932	1,109	1,087	1,686	2,063	2,435	2,994

Footnotes to Table 5-3F

Sum of operating costs for year in question, shown on corresponding lines of Table 5-2, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 20 years for solid and hazardous waste and 30 years for LUST and Superfund on the accumulated capital investment shown in Table 5-1 since 1972.

Table 5-3G: RCRA COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.1	Solid Waste															
	Existing Regulations															
	EPA	3	3	6	9	12	14	16	18	20	22	24	26	28	30	32
	Non-EPA Federal	284	333	365	400	438	478	520	565	606	650	698	750	803	861	920
	Local Government	6,305	6,580	6,532	6,751	6,973	7,198	7,353	7,510	7,668	7,826	7,988	8,150	8,311	8,473	8,636
	Private	9,701	10,413	10,087	10,339	10,588	10,833	10,988	11,119	11,239	11,371	11,494	11,603	11,711	11,796	11,874
	Total Existing Regs	16,294	17,330	16,991	17,500	18,011	18,522	18,877	19,212	19,533	19,869	20,204	20,529	20,853	21,160	21,463
	Federally Mandated	1,088	1,186	1,203	1,264	1,328	1,394	1,453	1,514	1,571	1,632	1,696	1,763	1,832	1,904	1,978
	New Regulations															
	Local Government						443	691	916	1,140	1,243	1,346	1,449	1,552	1,655	1,758
	Private							136	195	254	313	313	313	313	313	313
	Total New Regs						443	826	1,110	1,393	1,555	1,658	1,761	1,864	1,967	2,070
	Total Solid Waste	16,294	17,330	16,991	17,500	18,011	18,966	19,703	20,322	20,926	21,424	21,862	22,291	22,718	23,127	23,533
	Federally Mandated	1,088	1,186	1,203	1,264	1,328	1,837	2,279	2,625	2,965	3,187	3,354	3,525	3,697	3,872	4,049
5.2	Hazardous Waste															
	Existing Regulations															
	EPA	202	239	231	214	210	236	245	254	263	272	281	290	299	308	317
	Non-EPA Federal	21	34	43	284	449	678	1,319	1,721	2,165	2,476	2,799	3,148	3,497	3,846	4,194
	State Government															
	Local Government															
	Private	1,005	1,173	1,346	1,525	1,710	1,902	2,101	2,306	2,517	2,736	2,960	3,191	3,429	3,673	3,923
	Total Existing Regs	1,229	1,445	1,620	2,023	2,370	2,816	3,665	4,281	4,946	5,484	6,040	6,629	7,225	7,827	8,435
	Federally Mandated	1,229	1,445	1,620	2,023	2,370	2,816	3,665	4,281	4,946	5,484	6,040	6,629	7,225	7,827	8,435
	New Regulations															
	EPA		3	3	3	3	3	3	3	3	3	3	3	3	3	3
	State Government		9	9	9	9	9	9	9	5	5	5	5	5	5	5
	Private	207	305	1,523	1,692	2,222	3,255	3,887	4,022	4,206	4,356	4,083	4,340	4,489	4,638	4,751
	Total New Regs	207	317	1,535	1,704	2,234	3,267	3,899	4,034	4,214	4,364	4,091	4,348	4,497	4,646	4,759
	Total Hazardous Waste	1,436	1,762	3,155	3,727	4,604	6,083	7,564	8,315	9,160	9,848	10,131	10,977	11,721	12,473	13,194
	Federally Mandated	1,436	1,762	3,155	3,727	4,604	6,083	7,564	8,315	9,160	9,848	10,131	10,977	11,721	12,473	13,194
5.3	LUST															
	Existing Regulations															
	EPA		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Total Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	Federally Mandated		1	13	30	30	41	52	62	72	81	91	101	111	120	130
	New Regulations															
	Local Government				130	256	311	370	420	315	290	293	295	359	343	344
	Private				1,285	3,195	3,788	4,311	4,819	3,602	3,262	3,308	3,355	4,539	4,249	4,259
	Total New Regs				1,415	3,452	4,099	4,682	5,239	3,917	3,552	3,601	3,650	4,898	4,592	4,603
	Total LUST		1	13	1,444	3,482	4,140	4,734	5,301	3,988	3,634	3,692	3,751	5,008	4,713	4,733
	Federally Mandated		1	13	1,444	3,482	4,140	4,734	5,301	3,988	3,634	3,692	3,751	5,008	4,713	4,733
5.4	Total RCRA	17,730	19,093	20,159	22,671	26,097	29,189	32,001	33,939	34,075	34,906	35,685	37,019	39,448	40,313	41,461
	Federally Mandated	2,524	2,949	4,371	6,436	9,414	12,060	14,577	16,241	16,113	16,669	17,177	18,253	20,427	21,057	21,976

Footnotes to Table 5-3G

Sum of operating costs for year in question, shown on corresponding lines of Table 5-2A, plus amortized capital costs assuming an interest rate of ten percent and a capital life of 20 years for solid and hazardous waste and 30 years for LUST on the accumulated capital investment shown in Tables 5-1 and 5-1A since 1972.

Table 5-3H: CERCLA COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.5	Superfund															
	Existing Regulations															
	EPA	271	493	672	850	985	1,126	1,310	1,506	1,713	1,933	2,165	2,410	2,667	2,935	3,217
	Non-EPA Federal	84	125	161	324	467	664	1,108	1,466	1,790	2,121	2,389	2,686	2,983	3,279	3,576
	State Government	45	54	83	118	155	198	244	296	352	413	479	549	625	704	789
	Local Government															
	Private	71	115	167	280	395	523	667	824	996	1,182	1,383	1,598	1,828	2,072	2,331
	Total Existing Regs	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
	Federally Mandated	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
	New Regulations															
	Local Government															
	Private															
	Total New Regs															
	Full Implementation															
	Total Superfund	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
	Federally Mandated	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
5.6	Total Land	18,200	19,881	21,242	24,244	28,098	31,700	35,330	38,030	38,927	40,556	42,101	44,263	47,550	49,303	51,373
	Federally Mandated	2,994	3,737	5,454	8,008	11,415	14,571	17,906	20,332	20,965	22,319	23,593	25,497	28,529	30,048	31,888

Footnotes to Table 5-3H

Sum of the operating costs for year in question, shown on corresponding lines of Table 5-2B, plus interest (assuming a rate of 10 percent) and depreciation on the basis of capital life of 30 years on accumulated capital investment shown in Tables 5-1 and 5-1B since 1972.

6. COSTS OF CHEMICAL CONTROL

This Chapter discusses the costs of controlling chemicals that have useful properties to man as well as undesirable environmental effects. In order to be consistent with both the relevant legislation and EPA administrative organization, these chemicals are divided into toxic substances and pesticides. The costs of chemical control are summarized in Tables 6-1, 6-2, and 6-3, and are discussed in the following sections:

6.1 Toxic substance control;
6.2 Pesticide control; and
6.3 Total chemical control costs.

The components of, and documentation for, the costs of toxic substances and pesticide control programs are contained in Appendices I and J, respectively.

Annualized costs of chemical control are calculated using capital amortization rates of three, seven, and ten percent, and an assumed capital life of 20 years. The annualized costs discussed below are those based on a seven percent rate. The annualized costs calculated using a rate of three percent are approximately one to five percent lower, and those calculated using a ten percent rate are one to five percent higher, than the estimates discussed below.

6.1. TOXIC SUBSTANCE CONTROL

The Toxic Substances Program is implemented under the authority of the Toxic Substances Control Act (TSCA) of 1976. Title II of the Act was amended in 1986 to add the Asbestos Hazard Emergency Response Act. Federal and private spending constitute the majority of expenditures under TSCA; however, states and local "educational agencies" are prominent in the implementation of the Title II asbestos programs.

TSCA provide two main types of regulatory authority: (1) collection of information to support assessments of the potential hazards of chemical substances; and (2) control of releases of, and human exposure to, toxic substances. The information collection components of TSCA include the authority to require chemical manufacturers and processors to perform tests on their products for health and environmental effects (TSCA Section 4); to provide certain information concerning the use and effects of new chemicals in advance of their being introduced into the market (TSCA Section 5); and to provide requested information relating to use, exposure, and effects of existing chemicals (TSCA Section 8). The control authority of TSCA (Sections 6 and 7) allows EPA to regulate the manufacture, processing, distribution in commerce, and the use and disposal of those substances deemed to pose a significant risk to human health or the environment.

Total annualized costs for TSCA increased from $47 million in 1977 to $402 million in 1986. Future costs are expected to rise substantially, however, due primarily to recently implemented regulations relating to asbestos in schools and asbestos in products. Annualized costs for TSCA are expected to reach $1.2 billion by the year 2000. The new asbestos rules will account for over 55 percent of the total annualized costs for TSCA by 1995.

6.1.1. EPA and Non-EPA Federal

EPA costs for administering toxic substances control programs increased steadily since the passage of TSCA, from an estimated $15 million in 1977 to $123 million in 1987. Future EPA costs are projected to follow this trend, reaching $175 million in 1995 and $214 million by the year 2000.

Non-EPA Federal costs under TSCA have been more variable. Federal costs increased from $32 million in 1977 to $271 million in 1980, but then fell in subsequent years. Federal costs were an estimated $127 million in 1987. Federal costs are expected to rise steadily in the future, however, reaching $157 million in 1995 and $180 million by the year 2000.[1]

6.1.2. State and Local Governments

Although the TSCA program involves mainly Federal expenditure for program implementation and private expenditure for compliance, states and localities bear some costs for the management of asbestos in schools under the 1986 Title II asbestos amendment. This amendment requires EPA to issue regulations prescribing proper inspection and abatement procedures for asbestos in school buildings. Local educational agencies are required to develop asbestos management plans for the school buildings under their respective authorities, and states are to establish contractor and laboratory accreditation programs. Annualized costs to local and state governments for asbestos removal in schools are expected to be $221 million in 1990, increasing to $568 million by 1993 and beyond.

6.1.3. Private

Under TSCA, private industry incurs costs as a result of regulation of chemicals on the existing TSCA Inventory as well as from review and regulation of new chemicals and new chemical uses. The private costs associated with existing chemicals include compliance with three rules under Section 6 restricting the manufacture, use, and distribution in commerce of polychlorinated biphenyls (PCBs) and one rule implementing a ban/phasedown on the use of asbestos in products. The costs associated with existing chemicals also stem from a number of information collection rules under TSCA Sections 4, 8 and 12. The private costs associated with new chemical uses include the costs of preparing and filing Premanufacture Notifications and the costs of complying with Significant New Use Rules.

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[1] The estimates of EPA TSCA costs in Tables 6-2 and 6-2A are for the toxic substance program as a whole. It should be noted that a comparison of Appendix I Tables I-4 and I-4A with Tables 6-2 and 6-2A shows that the more limited estimates of EPA costs in Appendix I, which cover only TSCA Section 5, are considerably lower than the total EPA outlays shown in the main text tables.

Total annualized costs to the private sector averaged approximately $82 million between 1978 and 1984, and rose gradually from $101 million in 1985 to $115 million in 1987. These costs are projected to rise significantly over the next decade, in large part due to the new asbestos ban/phasedown rule which is expected to add $53 million in annual costs by 1995 and $106 million by the year 2000. Total annualized costs to the private sector are projected to reach $218 million by 1995 and $271 million by the year 2000.

6.2. PESTICIDE CONTROL

The pesticide program is implemented under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). Originally enacted in 1947, FIFRA received a major overhaul in 1972 and has been amended a number of times since, the last in 1988. Pesticide program expenditures include those at the Federal and state levels for the registration and re-registration of pesticide active ingredients, certification of pesticide applicators, farmworker safety programs, and enforcement. At the private level (including manufacturers, formulators, distributors and applicators), costs are associated with compliance with FIFRA requirements, including registration-related toxicology and other pesticide testing, pesticide disposal, storage, and application requirements, and pesticide cancellations and suspensions.

Total annualized costs for pesticide regulation increased from $92 million in 1972 to $508 million in 1979. Annual costs fell slightly over next the several years, averaging $432 over the period 1980-1988. Beginning in 1989, costs are expected to increase significantly due primarily to accelerated pesticide re-registration and increased farmworker safety requirements mandated by the 1988 FIFRA amendments. Future annual costs are expected to rise from an estimated $697 million in 1989 to $1.3 billion in 1995, and to over $1.6 billion by the year 2000.

6.2.1. EPA

EPA expenditures are associated primarily with pesticide registration. EPA approval is required for the registration of all new pesticide products. Additionally, to ensure that previously registered pesticides measure up to current scientific and regulatory standards, FIFRA requires the review and re-registration of all existing pesticides. Of the approximately 600 active ingredients requiring re-registration under FIFRA, EPA has issued registration standards for about 185. A registration standard includes a comprehensive review of all the available data on the active ingredient, a list of additional data needed for full registration, and EPA's current regulatory position on the pesticide. Based on the pesticide test data, EPA may restrict the uses of pesticide products, cancel the registration of pesticides deemed by the agency to cause unreasonable adverse effects on human health or the environment, or suspend pesticide registration to prevent an imminent hazard. Other EPA costs include grants to the states for enforcement, and certification and training programs for pesticide applicators.

Total annual EPA costs under FIFRA averaged approximately $50 million over the years 1972 to 1988. EPA costs are expected to jump to over $110 million during 1989 and 1990 due to the agency's development of pesticide storage and disposal requirements and for reimbursement of storage costs to eligible registrants pursuant to the 1988 FIFRA amendments. Agency costs are expected to fall to about $61 million in 1991, and then rise slowly over the remainder of the decade, reaching $86 million by year 2000.

6.2.2. State and Local Governments

States have the primary responsibility for FIFRA enforcement, and state expenditures are mostly for these activities. States may also be authorized to implement applicator certification and training and farmworker safety programs and to issue experimental use permits.

State costs for all activities were less than $1 million per year from 1972 through 1976, but jumped to $25 million in 1979. From 1980 through 1988, state costs averaged approximately $18 million per year. Annual state costs for all activities are expected to average approximately $24 million over the years 1989 through 2000.

6.2.3. Private

Private expenditures are borne by the affected commercial and agricultural concerns involved with the registration, sale, storage, disposal and application of pesticides. The majority of private compliance costs for years 1972 through 1988 were associated with registration-related pesticide testing, pesticide storage and disposal, and pesticide cancellation and suspension. Private costs for all activities rose steadily from $65 million in 1972 to $392 million in 1979. From 1980 through 1988, private costs for FIFRA averaged approximately $350 million per year. Future private costs are expected to rise significantly due to acceleration of the re-registration process and increased farmworker safety requirements mandated by the 1988 FIFRA amendments. Private costs jumped to over $550 million in 1989, and are expected to increase to an estimated $1.6 billion by the year 2000.

6.3. TOTAL CHEMICAL CONTROL COSTS

Total annualized costs of chemical control increased from $92 million in 1972 to $889 million in 1980. Costs then fell until 1983, when they started to increase again, reaching about $820 million in 1986-87. Private sector pesticide control costs accounted for over 40 percent of these expenditures. Total costs are expected to increase significantly over the next several years, reaching about $2.5 billion in 1995 and $2.9 billion by the year 2000. Private expenditures for pesticide control are projected to increase to an more than $1.6 billion by the year 2000. The increase in private pesticide costs is due to an expected steady rise in costs for pesticide research and development, cancellations and suspensions, and increased farmworker safety and applicator training and certification costs. These cost increases reflect accelerated levels of pesticide re-registration activity and more stringent pesticide applicator and farmworker safety requirements mandated by the 1988 FIFRA Amendments.

Table 6-1: CHEMICAL SUBSTANCE CONTROL CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6.1	Toxic Substances															
	Existing Regulations															
	EPA															
	Non-EPA Federal						2	28	83	27	17	16	8	15	33	45
	Private							20				43	23	121	120	117
	Total Toxic Substances						2	46	83	27	17	59	31	136	153	162
	Federally Mandated						2	48	83	27	17	59	31	136	153	162
6.2	Pesticides															
	EPA															
	Non-EPA Federal															
	State Government															
	Local Government															
	Private															
	Total Pesticides															
	Federally Mandated															
6.3	Total Chemicals						2	48	83	27	17	59	31	136	153	162
	Federally Mandated						2	48	83	27	17	59	31	136	153	162

Footnotes to Table 6-1

TOXIC SUBSTANCES

EPA: Assumed to be zero; EPA expenditures for toxic substances are assumed to be operating costs.

Non-EPA Federal: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Private: From Appendix I, Table I-1, first line.

Existing Federally Mandated: Assumed to be 100 percent of total existing toxic substances pollution control costs.

Total Federally Mandated: Sum of total toxic substances pollution control costs.

PESTICIDES: As explained in Appendix J, pesticide capital costs are believed to be small and are taken to be zero in this report.

Table 6-1A: CHEMICAL SUBSTANCE CONTROL CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
6.1	Toxic Substances															
	Existing Regulations															
	EPA															
	Non-EPA Federal	45	42	48	53	59	65	70	76	82	87	93	99	104	110	116
	State Government															
	Local Government															
	Private	117	114	110	89	89	89	89	89							
	Total Existing Regs	162	156	158	143	148	154	160	165	82	87	93	99	104	110	116
	Federally Mandated	162	156	158	143	148	154	160	165	82	87	93	99	104	110	116
	New Regulations															
	Non-EPA Federal															
	Local Government				830	830	830	830								
	Private															
	Total New Regs				830	830	830	830								
	Total Toxic Substances	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
	Federally Mandated	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
6.2	Pesticides															
	EPA															
	Non-EPA Federal															
	State Government															
	Local Government															
	Private															
	Total Pesticides															
	Federally Mandated															
6.3	Total Chemicals	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
	Federally Mandated	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116

Footnotes to Table 6-1A

TOXIC SUBSTANCES

EPA: Assumed to be zero; EPA expenditures for toxic substances are assumed to be operating costs.

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Private: From Appendix I, Tables I-1 and I-1A, first line.

Existing Federally Mandated: Assumed to be 100 percent of costs associated with total existing regulations for toxic substances.

New Non-EPA Federal: Estimated on the basis of the regulations and sources in Appendix A.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of total costs associated with existing and new regulations for toxic substances.

PESTICIDES: As explained in Appendix J, pesticide capital costs are believed to be small and are taken to be zero in this report.

Table 6-2: CHEMICAL SUBSTANCE CONTROL OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6.1	Toxic Substances															
	Existing Regulations															
	EPA			9	5	9	15	19	69	79	119	95	88	82	87	110
	Non-EPA Federal						32	49	161	258	158	122	51	58	94	155
	State Government															
	Local Government															
	Private							85	102	77	74	76	72	67	70	63
	Total Toxic Substances			9	5	9	47	154	332	414	350	293	212	207	251	335
	Federally Mandated			9	5	9	47	154	332	414	350	293	212	207	251	335
6.2	Pesticides															
	EPA	26	33	35	36	65	64	50	75	69	64	52	48	49	58	53
	Non-EPA Federal					13	21	16	15	14	11	10	9	9	9	8
	State Government	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
	Local Government															
	Private	65	110	139	140	261	273	346	392	355	330	316	300	366	384	342
	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
	Federally Mandated	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	578	840	874	774	690	585	647	721	754
	Federally Mandated	92	143	183	181	349	408	578	840	874	774	690	585	647	721	754

Footnotes to Table 6-2

TOXIC SUBSTANCES

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1972-1974 are Budget Authority; data for 1975-1986 are Outlays).

Non-EPA Federal: 1974-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Private: From Appendix I, Table I-4, last line.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with toxic substance pollution control.

Total Federally Mandated: Sum of total costs associated with toxic substance pollution control.

PESTICIDES

EPA: From Appendix J, Table J-3, last line.

Non-EPA Federal: From Appendix J, Table J-4, last line.

State Government: From Appendix J, Table J-2, last line.

Private: From Appendix J, Table J-1, last line.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with existing pesticides pollution control.

Total Federally Mandated: Sum of total costs associated with pesticides pollution control.

Table 6-2A: CHEMICAL SUBSTANCE CONTROL OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
6.1	Toxic Substances															
	Existing Regulations															
	EPA	110	123	122	128	98	144	152	160	168	175	183	191	199	207	214
	Non-EPA Federal	155	97	95	92	89	87	84	81	79	76	73	71	68	66	63
	State Government															
	Local Government															
	Private	63	62	62	66	63	62	61	61	59	60	60	60	61	61	62
	Total Existing Regs	329	283	278	285	250	293	297	303	306	311	317	322	328	334	339
	Federally Mandated	329	283	278	285	250	293	297	303	306	311	317	322	328	334	339
	New Regulations															
	Non-EPA Federal															
	Local Government	6		80	80	64	128	191	255	255	255	255	255	255	255	255
	Private				4	4	4	4	50	52	53	94	97	100	103	106
	Total New Regs	6		80	84	68	132	195	305	307	308	349	352	355	358	361
	Total Toxic Substances	335	283	358	369	318	425	492	608	613	619	666	674	683	692	700
	Federally Mandated	335	283	358	369	318	425	492	608	613	619	666	674	683	692	700
6.2	Pesticides															
	EPA	53	52	59	111	114	61	63	65	68	71	74	77	80	83	86
	Non-EPA Federal	8	8	7	7	7	8	7	7	7	7	8	8	8	8	8
	State Government	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
	Local Government															
	Private	342	378	372	554	838	995	1,079	1,159	1,207	1,252	1,301	1,356	1,399	1,465	1,537
	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
	Federally Mandated	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	754	736	813	1,066	1,297	1,510	1,662	1,865	1,917	1,972	2,072	2,140	2,199	2,273	2,358
	Federally Mandated	754	736	813	1,066	1,297	1,510	1,662	1,865	1,917	1,972	2,072	2,140	2,199	2,273	2,358

Footnotes to Table 6-2A

TOXIC SUBSTANCES

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on historical data for the years 1974-1990.

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Existing Private: From Appendix I, Table I-4A, last line.

Existing Federally Mandated: Assumed to be 100 percent of total costs associated with existing toxic substance regulations.

New Non-EPA Federal: Estimated on the basis of the regulations and sources listed in Appendix A.

New Local Government: Estimated on the basis of the regulations and sources listed in Appendix A.

New Private: Estimated on the basis of the regulations and sources listed in Appendix A.

Total Federally Mandated: Sum of the sum of costs associated with existing and new toxic substances regulations.

PESTICIDES

EPA: From Appendix J, Table J-3A, last line.

Non-EPA Federal: From Appendix J, Table J-4A, last line.

State Government: From Appendix J, Table J-2A, last line.

Private: From Appendix J, Table J-1A, last line.

Existing Federally Mandated: Assumed to be 100 percent of total costs of existing pesticides pollution control.

Total Federally Mandated: Sum of total costs associated with pesticides pollution control.

Table 6-3: CHEMICAL SUBSTANCE CONTROL COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6.1	Toxic Substances															
	Existing Regulations															
	EPA			9	5	9	15	19	69	79	119	95	88	82	87	110
	Non-EPA Federal						32	52	172	271	173	138	68	77	116	181
	State Government															
	Local Government															
	Private							87	104	79	76	82	80	86	101	105
	Total Toxic Substances			9	5	9	47	158	345	429	367	315	237	245	303	402
	Federally Mandated			9	5	9	47	158	345	429	367	315	237	245	303	402
6.2	Pesticides															
	EPA	26	33	35	36	65	64	50	75	69	64	52	48	49	58	53
	Non-EPA Federal					13	21	16	15	14	11	10	9	9	9	8
	State Government	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
	Local Government															
	Private	65	110	139	140	261	273	346	392	355	330	316	300	366	384	342
	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
	Federally Mandated	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	583	853	889	791	712	610	685	773	822
	Federally Mandated	92	143	183	181	349	408	583	853	889	791	712	610	685	773	822

Footnote to Table 6-3

Sum of operating costs for year in question, shown on corresponding lines of Table 6-2, plus amortized capital costs assuming an interest rate of seven percent and a capital life of 20 years on the accumulated capital investment shown in Table 6-1 since 1972.

Table 6-3A: CHEMICAL SUBSTANCE CONTROL COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
6.1	Toxic Substances															
	Existing Regulations															
	EPA	110	123	122	128	98	144	152	160	168	175	183	191	199	207	214
	Non-EPA Federal	181	127	129	131	134	138	142	146	151	157	163	170	174	174	180
	State Government															
	Local Government															
	Private	105	115	125	137	143	150	158	167	164	165	165	166	164	165	165
	Total Existing Regs	396	365	376	396	375	432	452	473	483	497	512	526	537	546	560
	Federally Mandated	396	365	376	396	375	432	452	473	483	497	512	526	537	546	560
	New Regulations															
	Non-EPA Federal															
	Local Government	6		80	158	221	363	504	568	568	568	568	568	568	568	568
	Private				4	4	4	4	50	52	53	94	97	100	103	106
	Total New Regs	6		80	162	225	367	508	618	620	621	662	665	668	671	674
	Total Toxic Substances	402	365	456	558	600	799	960	1,091	1,104	1,119	1,174	1,192	1,206	1,217	1,234
	Federally Mandated	402	365	456	558	600	799	960	1,091	1,104	1,119	1,174	1,192	1,206	1,217	1,234
6.2	Pesticides															
	EPA	53	52	59	111	114	61	63	65	68	71	74	77	80	83	86
	Non-EPA Federal	8	8	7	7	7	8	7	7	7	7	8	8	8	8	8
	State Government	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
	Local Government															
	Private	342	378	372	554	838	995	1,079	1,159	1,207	1,252	1,301	1,356	1,399	1,465	1,537
	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
	Federally Mandated	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	822	819	910	1,255	1,579	1,885	2,130	2,348	2,408	2,472	2,580	2,657	2,721	2,799	2,892
	Federally Mandated	822	819	910	1,255	1,579	1,885	2,130	2,348	2,408	2,472	2,580	2,657	2,721	2,799	2,892

Footnote to Table 6-3A

Sum of operating costs for year in question, shown on corresponding lines of Table 6-2A, plus amortized capital costs assuming an interest rate of seven percent and a capital life of 20 years on the accumulated capital investment shown in Tables 6-1 and 6-1A since 1972.

Table 6-3B: CHEMICAL SUBSTANCE CONTROL COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6.1	Toxic Substances															
	Existing Regulations															
	EPA			9	5	9	15	19	69	79	119	95	88	82	87	110
	Non-EPA Federal						32	51	169	267	169	134	63	71	109	173
	State Government															
	Local Government															
	Private							87	103	78	75	81	78	81	92	93
	Total Toxic Substances			9	5	9	47	157	341	425	362	309	229	234	288	383
	Federally Mandated			9	5	9	47	157	341	425	362	309	229	234	288	383
6.2	Pesticides															
	EPA	26	33	35	36	65	64	50	75	69	64	52	48	49	58	53
	Non-EPA Federal					13	21	16	15	14	11	10	9	9	9	8
	State Government	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
	Local Government															
	Private	65	110	139	140	261	273	346	392	355	330	316	300	366	384	342
	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
	Federally Mandated	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	581	849	885	786	705	603	674	758	802
	Federally Mandated	92	143	183	181	349	408	581	849	885	786	705	603	674	758	802

Footnote to Table 6-3B

Sum of operating costs for year in question, shown on corresponding lines of Table 6-2, plus amortized capital costs assuming an interest rate of three percent and a capital life of 20 years on the accumulated capital investment shown in Table 6-1 since 1972.

Table 6-3C: CHEMICAL SUBSTANCE CONTROL COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
6.1	Toxic Substances															
	Existing Regulations															
	EPA	110	123	122	128	98	144	152	160	168	175	183	191	199	207	214
	Non-EPA Federal	173	118	119	120	121	123	125	128	130	134	137	141	144	143	146
	State Government															
	Local Government															
	Private	93	100	107	116	120	125	130	136	134	134	135	135	134	135	136
	Total Existing Regs	377	341	348	364	339	392	407	424	432	444	455	468	477	485	496
	Federally Mandated	377	341	348	364	339	392	407	424	432	444	455	468	477	485	496
	New Regulations															
	Non-EPA Federal															
	Local Government	6		80	136	176	295	414	478	478	478	478	478	478	478	478
	Private				4	4	4	4	50	52	53	94	97	100	103	106
	Total New Regs	6		80	140	180	299	418	528	530	531	572	575	578	581	584
	Total Toxic Substances	383	341	428	504	519	691	825	952	962	975	1,028	1,043	1,055	1,066	1,080
	Federally Mandated	383	341	428	504	519	691	825	952	962	975	1,028	1,043	1,055	1,066	1,080
6.2	Pesticides															
	EPA	53	52	59	111	114	61	63	65	68	71	74	77	80	83	86
	Non-EPA Federal	8	8	7	7	7	8	7	7	7	7	8	8	8	8	8
	State Government	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
	Local Government															
	Private	342	378	372	554	838	995	1,079	1,159	1,207	1,252	1,301	1,356	1,399	1,465	1,537
	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
	Federally Mandated	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	802	795	882	1,200	1,498	1,777	1,995	2,209	2,267	2,328	2,434	2,508	2,571	2,647	2,738
	Federally Mandated	802	795	882	1,200	1,498	1,777	1,995	2,209	2,267	2,328	2,434	2,508	2,571	2,647	2,738

Footnote to Table 6-3C

Sum of operating costs for year in question, shown on corresponding lines of Table 6-2A, plus amortized capital costs assuming an interest rate of three percent and a capital life of 20 years on the accumulated capital investment shown in Tables 6-1 and 6-1A since 1972.

Table 6-3D: CHEMICAL SUBSTANCE CONTROL COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
6.1	Toxic Substances															
	Existing Regulations															
	EPA			9	5	9	15	19	69	79	119	95	88	82	87	110
	Non-EPA Federal						32	53	174	274	176	142	72	81	121	187
	State Government															
	Local Government															
	Private							88	104	79	76	84	82	91	108	115
	Total Toxic Substances			9	5	9	47	159	348	433	371	321	243	254	316	419
	Federally Mandated			9	5	9	47	159	348	433	371	321	243	254	316	419
6.2	Pesticides															
	EPA	26	33	35	36	65	64	50	75	69	64	52	48	49	58	53
	Non-EPA Federal					13	21	16	15	14	11	10	9	9	9	8
	State Government	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
	Local Government															
	Private	65	110	139	140	261	273	346	392	355	330	316	300	366	384	342
	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
	Federally Mandated	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	584	856	893	795	717	616	694	786	838
	Federally Mandated	92	143	183	181	349	408	584	856	893	795	717	616	694	786	838

Footnote to Table 6-3D

Sum of operating costs for year in question, shown on corresponding lines of Table 6-2, plus amortized capital costs assuming an interest rate of ten percent and a capital life of 20 years on the accumulated capital investment shown in Table 6-1 since 1972.

Table 6-3E: CHEMICAL SUBSTANCE CONTROL COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
6.1	Toxic Substances															
	Existing Regulations															
	EPA	110	123	122	128	98	144	152	160	168	175	183	191	199	207	214
	Non-EPA Federal	187	134	137	141	145	150	156	162	169	177	185	194	200	201	208
	State Government															
	Local Government															
	Private	115	128	140	154	163	172	182	192	190	190	191	191	189	190	190
	Total Existing Regs	413	385	400	423	406	466	489	514	527	543	559	576	588	597	613
	Federally Mandated	413	385	400	423	406	466	489	514	527	543	559	576	588	597	613
	New Regulations															
	Non-EPA Federal															
	Local Government	6		80	177	259	420	581	645	645	645	645	645	645	645	645
	Private				4	4	4	4	50	52	53	94	97	100	103	106
	Total New Regs	6		80	181	263	424	585	695	697	698	739	742	745	748	751
	Total Toxic Substances	419	385	480	605	669	891	1,074	1,209	1,224	1,241	1,298	1,318	1,333	1,345	1,364
	Federally Mandated	419	385	480	605	669	891	1,074	1,209	1,224	1,241	1,298	1,318	1,333	1,345	1,364
6.2	Pesticides															
	EPA	53	52	59	111	114	61	63	65	68	71	74	77	80	83	86
	Non-EPA Federal	8	8	7	7	7	8	7	7	7	7	8	8	8	8	8
	State Government	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
	Local Government															
	Private	342	378	372	554	838	995	1,079	1,159	1,207	1,252	1,301	1,356	1,399	1,465	1,537
	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
	Federally Mandated	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	838	839	934	1,301	1,648	1,976	2,244	2,466	2,528	2,594	2,705	2,783	2,849	2,927	3,022
	Federally Mandated	838	839	934	1,301	1,648	1,976	2,244	2,466	2,528	2,594	2,705	2,783	2,849	2,927	3,022

Footnote to Table 6-3E

Sum of operating costs for year in question, shown on corresponding lines of Table 6-2A, plus amortized capital costs assuming an interest rate of ten percent and a capital life of 20 years on the accumulated capital investment shown in Tables 6-1 and 6-1A since 1972.

7. COSTS OF MULTI-MEDIA CONTROL PROGRAMS

There are a number of environmental protection programs that are not directed towards controlling pollution in any one environmental medium. The costs of these programs are shown in Tables 7-1, 7-2, and 7-3, and discussed in the following sections:

7.1. Management and support;
7.2. Energy;
7.3. Interdisciplinary;
7.4. Emergency planning and community right to know;
7.5. Undesignated non-EPA Federal; and
7.6. Total multi-media costs.

Annualized costs for multi-media programs were calculated using capital amortization rates of three, seven, and ten percent, and an assumed 20 year capital life. The annualized costs discussed below are those calculated using a seven percent rate. The estimates derived using a three percent rate are approximately one to six percent lower, and those calculated using a ten percent rate are one to five percent higher, than the estimates discussed below.

7.1. EPA MANAGEMENT AND SUPPORT

EPA expenditures for the Management and Support Program provide executive direction and policy oversight for all EPA programs as well as administrative and support services not assigned to specific programs. Program expenditures rose gradually over time from a low of $96 million in 1972 to $276 million in 1987. Annual costs are projected to increase to $460 million by the year 2000. The major components of management and support are: program management, agency management, regional management and support, and general support services for all agency programs.

Program management includes policy development, program development and oversight, and the associated management activities for eight of EPA's program offices. These program offices include Air and Radiation, Water, Enforcement and Compliance Monitoring, External Affairs, Pesticides and Toxic Substances, General Counsel, Research and Development, and Solid Waste and Emergency Response. In addition, liaison activities are performed with other Federal agencies and offices, including the Office of Management and Budget.

Agency management is comprised of the following functions and activities: policy direction; policy, planning and evaluation; legal services for litigation; external affairs; inspector general activities; and administration and resource management. Activities under the Agency management budget are concerned with providing support and guidance to the agency on its policies. In addition, assistance is provided to ensure policy and program implementation.

Regional management provides centralized management and administrative functions for the regional offices as well as direction and support for administrative and financial services, budget development and execution, and legal and analytical support. The program consists of several elements ranging from resource management to financial management to regional management and counsel. Expenditures cover the regional and deputy regional administrators, their immediate staffs and regional staff for public affairs, Congressional and intergovernmental relations, and civil rights.

The final component of management and support is general support services for all agency programs. This component accounts for the largest expenditure. General support is provided for all agency programs except Superfund. Support is provided in the areas of professional training, support services, automated data processing, and laboratory support.

7.2. EPA ENERGY PROGRAM

The Energy Program is a multi-media research and development effort aimed at providing scientific information for the evaluation of environmental impacts from, and the potential controls on, the nation's energy sector. Expenditures are incurred only by EPA since the program is limited to research and development, and does not involve the implementation of a regulatory program.

EPA costs rose gradually from $46 million in 1974 to $183 million in 1980. Since 1980, expenditures for the Energy Program have fallen steadily, reaching $54 million in 1987. Projections for future annual costs show program costs falling further over time, reaching zero by the year 1996.

For the past several years, the Energy Program has concentrated on two principal areas of research: acid deposition and limestone injection multistage burner (LIMB) control technology. The agency's acid deposition research is a component of the National Acid Precipitation Assessment Program (NAPAP) established by the Energy Security Act of 1980. The current research addresses both sources and effects of acid deposition. This includes developing estimates of man-made sulfur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOCs), and alkaline material air emissions; field studies and model development of atmospheric transport, transformation, and deposition processes; monitoring and measurement of wet and dry deposition levels; assessment and quantification of aquatic and terrestrial effects of acid deposition; assessment of effects on materials and cultural resources; and evaluation of "cost of controls" data.

EPA expenditures on LIMB control technology involves research designed to develop, demonstrate, and evaluate emission control systems to reduce air emissions of SO_x and NO_x from pulverized coal-fired boilers. Specifically, the research program involves pilot-scale testing of LIMB processes, commercial demonstrations of the wall- fired boiler and the tangential-fired boiler technologies, and the analyses of waste characteristics and disposal from the commercial scale tangential-fired boiler technology.

7.3. EPA INTERDISCIPLINARY PROGRAM

The Interdisciplinary Program addresses environmental issues that affect several media and require an interdisciplinary approach. Activities within the program include inter-media research, Federal agency compliance with pollution control laws, and the legal aspects of the agency's enforcement efforts.

Annual program expenditures increased from $11 million in 1972 to $37 million in 1980. Expenditures fell to approximately $17 million for each of the years 1981-82, and then began to climb, reaching $59 million in 1987. Annual costs for the program are projected to rise steadily in the future to $184 million in the year 2000.

The Interdisciplinary Research Program encompasses several different programs which are outlined below.

- The Scientific Assessment Program has responsibility for developing and ensuring consistency of approach to uniform risk assessment guidelines for the Agency.

- The Technical Information and Liaison Program provides for the production and transfer of technical and scientific information from the Office of Research and Development (ORD) with a focus on communicating cost-effective methods for complying with EPA regulations.

- The Regulatory Support Program works to ensure that Agency regulation development is consistent with current technical and scientific research findings.

- The Exploratory Research Program conducts long-range exploratory research.

- The Quality Assurance Program provides centralized guidance and management for agency-wide quality assurance activities and performs audits to assess their effectiveness.

- The Integrated Program to reduce uncertainties in risk assessment develops exposure and exposure-response models for estimating adverse effects on humans and ecosystems attributable to environmental pollution.

- The NEPA Compliance Program ensures that Agency activities comply with the intent of NEPA.

- The Federal Facilities Compliance program oversees Federal compliance with all Federal statutory requirements.

- The Environmental Review Program ensures that Federal agencies carry out their activities in an environmentally sound manner, pursuant to NEPA and Section 309 of the Clean Water Act.

- The Indians Program develops and implements interdisciplinary policies for dealing with Indian tribes on environmental problems.

- The Enforcement Policy and Operations provides guidance for consistent enforcement activities for all non-Superfund activities, including establishment of enforcement and monitoring priorities and policies for enforcement procedure selection and investigation efforts, legal case development, litigation, and adjudicatory hearing activities for media enforcement programs.

- The National Enforcement Investigations Center provides support in preparing enforcement cases and serves as a point of coordination and support for complex investigations.

7.4. COMMUNITY RIGHT TO KNOW PROGRAM (EPCRA)

The Emergency Planning and Community Right to Know Act (EPCRA), also known as the SARA Title III, sets requirements for Federal, state, and local governments and industry regarding emergency planning and "community right-to-know" reporting on hazardous and toxic chemicals. EPCRA provides for public access to information on possible hazardous chemical exposures and releases to all environmental media.

The annualized costs of the EPCRA provisions were an estimated $277 million in 1988, $545 million in 1989, and are estimated to reach almost $600 million in 1990. Future costs are expected to be $916 million per year. The private sector is expected to account for about 96 percent of these expenditures, and local governments the remainder. No data are available on state and Federal costs under the program.

7.5. UNDESIGNATED NON-EPA FEDERAL

A significant portion of non-EPA Federal expenditures for environmental-related activities are not broken down by media. They have been included under the multi-media section although it is not known whether they actually possess a multi-media character. Such non-EPA Federal expenditures have been relatively high, increasing from $268 million in 1974 to $485 million in 1979. Annual expenditures averaged $368 million during the period 1981-1988. If recent trends continue into the future, these EPA expenditures will rise over the next several years, reaching $738 million by the year 2000.

7.6. TOTAL MULTI-MEDIA COSTS

On an annualized basis, total expenditures for multi-media environmental programs increased from $108 million in 1972 to $869 million in 1980. Over 50 percent of these expenditures are non-EPA Federal costs, and approximately 25 percent are EPA costs for its management and support programs. During the period 1981-1987, annual expenditures on multi-media programs averaged $728 million. Future annual costs are expected to rise significantly, largely due to the costs associated with the recently implemented EPCRA provisions. Annual costs are expected to increase from an estimated $842 million in 1987 to $2.3 billion by the year 2000. The EPCRA provisions are expected to account for approximately 40 percent of these costs, undesignated non-EPA Federal programs 32 percent, and EPA management and support programs 20 percent.

Table 7-1: MULTI-MEDIA PROGRAMS CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
7.1	Management & Spt (EPA)															
7.2	Energy (EPA)															
7.3	Interdisciplin (EPA)															
7.4	EPCRA															
	EPA															
	Local Government															
	Private															
	Total EPCRA															
7.5	Undesig (Non-EPA Fed)				4	19	45	13	42	68	120	76	79	109	84	46
7.6	Total Multi-Media				4	19	45	13	42	68	120	76	79	109	84	46

Footnotes for Table 7-1

UNDESIGNATED

Non-EPA Federal: 1981-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Table 7-1A: MULTI-MEDIA PROGRAMS CAPITAL COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7.1	Management & Spt (EPA)															
7.2	Energy (EPA)															
7.3	Interdisciplin (EPA)															
7.4	EPCRA															
	EPA															
	Local Government			149												
	Private			1,716	371	1,519										
	Total EPCRA			1,865	371	1,519										
7.5	Undesig (Non-EPA Fed)	46	43	34	24	15	5									
7.6	Total Multi-Media	46	43	1,899	395	1,534	5									

Footnotes for Table 7-1A

EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW (EPCRA)

Local government: Estimated on the basis of the regulations and sources listed in Appendix A.

Private: Estimated on the basis of the regulations and sources listed in Appendix A.

UNDESIGNATED

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Table 7-2: MULTI-MEDIA PROGRAMS OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
7.1	Management & Spt (EPA)	96	108	117	127	118	246	250	216	214	257	244	243	269	271	282
7.2	Energy (EPA)			46	43	117	160	187	156	183	137	105	72	47	43	58
7.3	Interdisciplin (EPA)	11	30	30	34	28	37	51	29	37	18	16	28	43	56	53
7.4	EPCRA															
	EPA															
	Local Government															
	Private															
	Total EPCRA															
7.5	Undesig (Non-EPA Fed)			268	384	463	470	408	473	416	253	205	305	245	254	458
7.6	Total Multi-Media	108	139	461	587	726	913	896	875	850	665	570	648	603	625	851

Footnotes for Table 7-2

MANAGEMENT & SUPPORT

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (amount for 1974 is Budget Authority; data for 1975-1986 are Outlays).

ENERGY

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (amount for 1974 is Budget Authority; data for 1975-1986 are Outlays).

INTERDISCIPLINARY

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (amount for 1974 is Budget Authority; data for 1975-1986 are Outlays).

UNDESIGNATED

Non-EPA Federal: 1981-86 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce.

Table 7-2A: MULTI-MEDIA PROGRAMS OPERATING COSTS

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7.1	Management & Spt (EPA)	282	276	313	323	342	378	363	375	387	399	411	424	436	448	460
7.2	Energy (EPA)	58	54	53	51	40	24	25	19	13	6					
7.3	Interdisciplin (EPA)	53	59	58	59	100	126	111	120	129	138	147	156	165	175	184
7.4	EPCRA															
	EPA															
	Local Government				24	24	24	24	24	24	24	24	24	24	24	24
	Private			101	310	216	538	538	538	538	538	538	538	538	538	538
	Total EPCRA			101	334	240	562	562	562	562	562	562	562	562	562	562
7.5	Undesig (Non-EPA Fed)	458	382	405	428	450	473	496	519	541	564	587	610	632	655	678
7.6	Total Multi-Media	851	772	930	1,196	1,172	1,563	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883

Footnotes for Table 7-2A

MANAGEMENT & SUPPORT

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on data for the years 1981-1990.

ENERGY

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on data for the years 1986-1990.

INTERDISCIPLINARY

EPA: Data from annual Justification of Appropriation Estimates for Committee on Appropriations (data for 1986-1988 are Outlays; amount for 1989 is Current Estimate; amount for 1990 is Request). Linear projection of expenditures for 1991-2000 based on data for the years 1981-1990.

EMERGENCY PLANNING AND COMMUNITY RIGHT TO KNOW (EPCRA)

Local government: Estimated on the basis of the regulations and sources listed in Appendix A.

Private: Estimated on the basis of the regulations and sources listed in Appendix A.

UNDESIGNATED

Non-EPA Federal: 1986 data from Federal Funding for Pollution Control survey forms completed by each Federal Agency and submitted to the Bureau of Economic Analysis, U.S. Department of Commerce. Linear projection of expenditures for 1987-2000 based on historical data for the years 1981-1986.

Table 7-3: MULTI-MEDIA PROGRAMS COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
7.1 Management & Spt (EPA)	96	108	117	127	118	246	250	216	214	257	244	243	269	271	282
7.2 Energy (EPA)			46	43	117	160	187	156	183	137	105	72	47	43	58
7.3 Interdisciplin (EPA)	11	30	30	34	28	37	51	29	37	18	16	28	43	56	53
7.4 EPCRA															
EPA															
Local Government															
Private															
Total EPCRA															
7.5 Undesig (Non-EPA Fed)			268	384	465	476	416	485	434	282	242	349	299	316	525
7.6 Total Multi-Media	108	139	461	587	729	919	903	886	868	695	606	692	657	687	918

Footnotes to Table 7-3

Sum of operating costs for year in question, shown on corresponding lines of Table 7-2, plus amortized capital costs assuming an interest rate of 7 percent and a capital life of 20 years on the accumulated capital investment shown in Table 7-1 since 1972.

Table 7-3A: MULTI-MEDIA PROGRAMS COSTS ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7.1	Management & Spt (EPA)	282	276	313	323	342	378	363	375	387	399	411	424	436	448	460
7.2	Energy (EPA)	58	54	53	51	40	24	25	19	13	6					
7.3	Interdisciplin (EPA)	53	59	58	59	100	126	111	120	129	138	147	156	165	175	184
7.4	EPCRA															
	EPA															
	Local Government			14	38	38	38	38	38	38	38	38	38	38	38	38
	Private			263	507	556	878	878	878	878	878	878	878	878	878	878
	Total EPCRA			277	545	594	916	916	916	916	916	916	916	916	916	916
7.5	Undesig (Non-EPA Fed)	525	453	479	504	528	551	574	597	619	642	663	681	703	721	738
7.6	Total Multi-Media	918	842	1,180	1,483	1,603	1,995	1,989	2,027	2,065	2,102	2,138	2,177	2,220	2,260	2,298

Footnotes to Table 7-3A

Sum of operating costs for year in question, shown on corresponding lines of Table 7-2A, plus amortized capital costs assuming an interest rate of 7 percent and a capital life of 20 years on the accumulated capital investment shown in Tables 7-1 and 7-1A since 1972.

Table 7-3B: MULTI-MEDIA PROGRAMS COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
7.1	Management & Spt (EPA)	96	108	117	127	118	246	250	216	214	257	244	243	269	271	282
7.2	Energy (EPA)			46	43	117	160	187	156	183	137	105	72	47	43	58
7.3	Interdisciplin (EPA)	11	30	30	34	28	37	51	29	37	18	16	28	43	56	53
7.4	EPCRA															
	EPA															
	Local Government															
	Private															
	Total EPCRA															
7.5	Undesig (Non-EPA Fed)			268	384	465	475	413	481	429	274	231	336	284	298	505
7.6	Total Multi-Media	108	139	461	587	728	917	901	883	863	686	596	679	642	669	898

Footnotes to Table 7-3B

Sum of operating costs for year in question, shown on corresponding lines of Table 7-2, plus amortized capital costs assuming an interest rate of 3 percent and a capital life of 20 years on the accumulated capital investment shown in Table 7-1 since 1972.

Table 7-3C: MULTI-MEDIA PROGRAMS COSTS ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7.1	Management & Spt (EPA)	282	276	313	323	342	378	363	375	387	399	411	424	436	448	460
7.2	Energy (EPA)	58	54	53	51	40	24	25	19	13	6					
7.3	Interdisciplin (EPA)	53	59	58	59	100	126	111	120	129	138	147	156	165	175	184
7.4	EPCRA															
	EPA															
	Local Government			10	34	34	34	34	34	34	34	34	34	34	34	34
	Private			216	450	458	780	780	780	780	780	780	780	780	780	780
	Total EPCRA			226	484	492	814	814	814	814	814	814	814	814	814	814
7.5	Undesig (Non-EPA Fed)	505	433	458	482	506	529	551	574	597	619	641	661	682	702	720
7.6	Total Multi-Media	898	822	1,108	1,400	1,479	1,871	1,865	1,902	1,940	1,978	2,014	2,055	2,098	2,139	2,178

Footnotes to Table 7-3C

Sum of operating costs for year in question, shown on corresponding lines of Table 7-2A, plus amortized capital costs assuming an interest rate of 3 percent and a capital life of 20 years on the accumulated capital investment shown in Tables 7-1 and 7-1A since 1972.

Table 7-3D: MULTI-MEDIA PROGRAMS COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
7.1	Management & Spt (EPA)	96	108	117	127	118	246	250	216	214	257	244	243	269	271	282
7.2	Energy (EPA)			46	43	117	160	187	156	183	137	105	72	47	43	58
7.3	Interdisciplin (EPA)	11	30	30	34	28	37	51	29	37	18	16	28	43	56	53
7.4	EPCRA															
	EPA															
	Local Government															
	Private															
	Total EPCRA															
7.5	Undesig (Non-EPA Fed)			268	384	466	478	418	487	438	290	250	360	313	331	541
7.6	Total Multi-Media	108	139	461	587	729	921	905	889	873	702	615	702	671	702	934

Footnotes to Table 7-3D

Sum of operating costs for year in question, shown on corresponding lines of Table 7-2, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 20 years on the accumulated capital investment shown in Table 7-1 since 1972.

Table 7-3E: MULTI-MEDIA PROGRAMS COSTS ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7.1 Management & Spt (EPA)	282	276	313	323	342	378	363	375	387	399	411	424	436	448	460
7.2 Energy (EPA)	58	54	53	51	40	24	25	19	13	6					
7.3 Interdisciplin (EPA)	53	59	58	59	100	126	111	120	129	138	147	156	165	175	184
7.4 EPCRA															
EPA															
Local Government			18	42	42	42	42	42	42	42	42	42	42	42	42
Private			303	555	640	962	962	962	962	962	962	962	962	962	962
Total EPCRA			320	597	681	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003	1,003
7.5 Undesig (Non-EPA Fed)	541	470	497	522	547	570	593	616	638	661	681	699	720	738	752
7.6 Total Multi-Media	934	860	1,241	1,553	1,709	2,101	2,095	2,133	2,170	2,208	2,243	2,282	2,324	2,363	2,399

Footnotes to Table 7-3E

Sum of operating costs for year in question, shown on corresponding lines of Table 7-2A, plus amortized capital costs assuming an interest rate of 10 percent and a capital life of 20 years on the accumulated capital investment shown in Tables 7-1 and 7-1A since 1972.

8. TOTAL COSTS AND MAJOR SOURCES OF UNCERTAINTY

This chapter summarizes estimates of total costs for all pollution control efforts and examines briefly the major sources of uncertainty surrounding these estimates. Total costs are derived by aggregating the cost estimates for each of the environmental media presented in Chapters 3 through 7. These totals are presented in Tables 8-1 through 8-18 as explained below.

Total costs are given in several different ways. Tables 8-1 through 8-3 show costs by environmental medium under the present implementation scenario, which includes costs pursuant to all current and forthcoming control programs. Following the format of the cost tables presented in earlier chapters, Table 8-1 shows total capital costs, Table 8-2 shows total operating costs, and Table 8-3 shows total annualized costs based on capital amortization rates of seven, three, and ten percent, respectively. Tables 8-4 through 8-6 present total costs by environmental medium under the full implementation scenario, which includes the expenditures required to bring the nation into compliance with the ozone NAAQS and those required to satisfy all wastewater treatment needs, in addition to the costs for all current and forthcoming control programs. Tables 8-7 through 8-9 present total costs for the subset of environmental programs that are mandated by Federal laws and regulations. Tables 8-10 through 8-12 show total costs by funding source. Tables 8-13 and 8-14 show the effect on total annualized costs for air and water programs of including pre-1972 capital costs. Tables 8-15 through 8-17 show total costs by environmental medium, major EPA regulatory program, and by existing and new regulatory programs. Finally, Table 8-18 and 8-19 present total expenditures—which represent the sum of capital and operating costs—by environmental medium and by existing and new regulatory programs assuming full and present implementation, respectively.

8.1. GENERAL TRENDS IN TOTAL COSTS

General trends in pollution control costs over time are discussed in this section. The discussion proceeds in the same general order as the data tables. Where annualized costs are discussed, trends based on the estimates calculated at capital amortization rates of seven percent are given first. These are followed by a range of estimates bracketed by annualized cost estimates calculated at rates of three and ten percent, respectively. The ranges indicate the sensitivity of the cost estimates to the rate of capital amortization used for annualization. All the estimates are in 1986 dollars.

8.1.1. Total Capital Expenditures

As shown in more detail in Tables 8-1 and 8-4, total pollution control capital expenditures can be summarized as follows:

	1972	1987	1990	2000	
				Present Implementation	**Full Implementation**
Pollution Control Capital Investment (billions of 1986$)	20	30	41	30	39
Pollution Control Capital Investment (billions of 1990$)	23	35	47	35	45
As Percent of Total Capital Investment	2.5	2.3	2.8	1.7	1.9

Capital costs are also shown in 1990 dollars in order to make them more relevant for the time frame in which this Report will be issued.[1]

As shown in Tables 8-1 and 8-4, total pollution control capital expenditures were relatively stable at about $25-30 billion annually over the period 1975-87. There is expected to be a significantly higher level of capital expenditures during the period 1988-92, however. Capital expenditures are estimated to reach $43 billion in 1992, followed by falling levels over the years 1993-2000 except for a large jump in 1998. Capital expenditures are expected to reach $47 billion in 1998 due to over $10 billion in capital investment for the upgrade/replacement of underground storage tanks in that year. Capital expenditures are then expected to fall back to roughly $36 billion over years 1999-2000. It should be noted, however, that because some of the future cost estimates contained in the Regulatory Impact Analyses and other sources are given in terms of annualized costs rather than being disaggregated between capital and operating costs, capital costs for future years may be underestimated relative to operating costs because when in doubt it was sometimes easier to assign all of the annualized costs shown in these studies to operating costs. This has the advantage of resulting in no change in annualized costs but possibly some overstatement of operating costs.

To put these estimates in perspective in terms of their impact on the U.S. capital markets, it is useful to compare capital investment in pollution control as a percentage of total national investment in plant and equipment over time. Figure 8-1 shows the highest percentages were in the mid-1970s at a little over three percent. These rates were somewhat lower over the period 1978-1982, and even lower over the next five years. Pollution control capital costs were an estimated 2.3 percent of national capital expenditures in 1987.

Capital costs as a percentage of total capital investment jumped to 2.8 percent in 1988, but are estimated to fall steadily over the period 1989-1996, from 2.9 percent in 1989 to two percent in 1997. After a jump to 2.7 percent in 1998 due to large capital outlays for the upgrade/replacement of underground storage tanks, rates are expected to resume this fall, dropping to 1.7 percent by the year 2000.[2]

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[1] The costs shown in 1986 dollars were multiplied by 1.153 to obtain 1990 dollars, in accordance with the GNP deflator shown in Table 1-2.

8.1.2. Total Annualized Costs

As shown in Tables 8-3 and 8-6, total annualized costs for all pollution control activities in the United States at seven percent interest have increased and are projected to increase as follows:

				2000	
	1972	**1987**	**1990**	**Present Implementation**	**Full Implementation**
Total Annualized Costs (billions of 1986$)	26	85	100	148	160
Total Annualized Costs (billions of 1990$)	30	98	115	171	185
As Percent of GNP	0.9	1.9	2.1	2.6	2.8

In order to provide a frame of reference to judge the relative importance of environmental costs to a well-known aggregate measure of economic activity, annualized costs as a percentage of Gross National Product (GNP) is also computed,[3] even though the approach taken toward accounting for capital costs is different. Estimates of annualized costs over for the period 1972-2000 under each of the alternative scenarios are shown in Figure 8-2. Annual costs as a percentage of GNP are shown graphically in Figure 8-3.

If capital amortization rates of three and ten percent are used, the total annualized cost estimates range from $73-$95 billion in 1987. In the year 2000 costs would range from $126-$166 under the present implementation scenario, and $137-$179 billion under the full implementation scenario.

Although annualized costs have been and are projected to continue increasing, they are increasing at a decreasing rate. As shown in Figure 8-4, the yearly rate of increase in total annualized costs decreased from 14 percent between 1972 and 1973 to six to eight percent in the mid-1980s and is projected to fall further to about three percent in the late 1990s (assuming full implementation).

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[2] In order to compute capital investment in pollution control as a percentage of total capital investment for future years, data on total national plant and equipment expenditures over the period 1972-1988 (in constant 1986 dollars) were linearly extrapolated to years 1989-2000.

[3] In order to compute total pollution control costs as a percentage of GNP for future years, data on GNP over the period 1972-1989 (in constant 1986 dollars) were linearly extrapolated to years 1990-2000.

8.1.3. Total Federally-Mandated Costs

Table 8-9 shows total annualized costs for the subset of environmental programs that are Federally-mandated as follows:

	1972	**1987**	**1990**	**2000 (Assuming Full Implementation)**
Federally-Mandated Annualized Costs (billions of 1986$)	18	67	81	137
Federally-Mandated Annualized Costs (billions of 1990$)	21	77	93	158
As percent of GNP	0.9	1.9	2.1	2.4

If capital amortization rates of three and ten percent are used, the cost estimates for Federally-mandated programs under the full implementation scenario range from $56-$76 billion in 1987, $93-$125 billion in 1995, and $116-$155 billion in the year 2000.

8.1.4. Total Costs by Funding Source

Table 8-12 shows total annualized costs by funding source under the present implementation scenario. The changes are highlighted in Figure 8-5, which shows the percentage allocations in 1972, 1980, 1987, and 2000. The data indicate that the share of total annualized costs incurred by state and local governments fell during the 1970s at the expense of the Federal Government, which was expanding its environmental involvement, while private sector costs remained relatively stable. During the period 1980-87, there was remarkable stability in the cost shares. The future projections, however, are for a rapid growth in the non-EPA Federal share with a corresponding reduction in all other shares, particularly the private sector, over the period 1987-2000. The non-EPA Federal costs are projected to increase more than 140 percent over the period, primarily due to proposed Department of Defense and Department of Energy expenditures on military and nuclear waste clean-up. Although the share of EPA costs is projected to fall somehat over the period, the overall Federal share is projected to increase while that of state and local governments are projected to fall. By the year 2000, it is estimated that the private sector will account for about 60 percent of total costs, local governments more than 22 percent, non-EPA Federal agencies almost eight percent, the EPA about seven percent, and state governments a little more than three percent.

8.1.5. Total Costs by Environmental Medium

Table 8-17 shows total annualized costs broken down by environmental medium, major EPA program area, and by existing and new regulations. A line item is also included in the air and water categories for "full implementation" costs, which for air represent the costs associated with nationwide attainment of the NAAQS for ozone, and for water represent the costs of fulfilling the nation's wastewater treatment needs.

The data on costs by environmental medium show that the relative shares of total costs in the year 1975 were: approximately 30 percent for air and radiation, 41 percent for water, 27 percent for land (including the costs associated with solid waste collection and disposal services), and less than 1 percent for chemicals. By 1980, the share of total costs accounted for by water programs had increased to 43 percent, the share for land programs had decreased to 23 percent, and the shares for other media had remained unchanged. These cost shares remained fairly constant over the period 1981-1988. The cost projections indicate that by the year 2000 the shares of total costs accounted for by air and water programs will fall slightly to around 28 and 40 percent, respectively; the share of land costs will rise to over 28 percent; and chemical regulation costs will increase to about 1.8 percent.

Figure 8-6 shows total annualized costs under the full implementation scenario as a percentage of GNP, broken down by environmental medium. The figure shows that costs for land pollution control have recently been increasing faster than those for any other environmental medium except chemicals, and are expected to do so through the year 2000. A breakdown of land costs into their four major components—solid waste, hazardous waste, underground storage tanks, and Superfund—is shown in Figure 8-7.

By the year 2000, total annualized costs under the full implementation scenario would be approximately $72 billion more than year 1988 costs, an increase of 80 percent. Roughly one-third of this increase is due to the estimated increase in costs for land pollution control programs. As existing RCRA and Superfund hazardous waste programs are more fully implemented, land costs are estimated to increase by more than $17.4 billion over the period 1988-2000. Moreover, new and forthcoming RCRA regulations are estimated to add another $8.4 billion in annual costs by the year 2000.

The air and water programs are also expected to impose significantly greater annual costs in the year 2000 than those estimated for 1988, although not enough to prevent a slight fall in the total cost shares accounted for by each medium. New regulatory programs directed towards the control of air toxics and acid rain are projected to increase annual air costs by over $7 billion by the year 2000. Also, the costs of fully implementing the Administration's strategy for attaining the existing NAAQS for ozone, listed under the "full implementation" line item, would add $6.5 billion in annual costs by the year 2000.

Annual costs for water programs are estimated to increase by approximately $15 billion over the period 1988-2000. This increase is due largely to additional expenditures for pretreatment and wastewater treatment, and new and forthcoming drinking water regulations. If the costs included in the full implementation line item are added to the total, annual water costs would increase by an additional $6 billion by the year 2000. These full implementation costs represent the expenditures needed for wastewater treatment above what Federal, state, and local governments are projected to spend for wastewater treatment over the period 1988-2000.

8.2. MAJOR SOURCES OF UNCERTAINTY

Considerable uncertainty surrounds the cost estimates presented in this report. Several possible contributing factors are discussed in the sections indicated below. They are classified according to whether they likely:

8.2.1. Bias the estimates in unknown directions;
8.2.2. Bias the estimates downward; or
8.2.3. Bias the estimates upward.

8.2.1. Factors Contributing to Bias in Unknown Directions

8.2.1.1. Commerce Department Survey Data

Uncertainty is inherent in the Commerce Department survey data used as the basis for the historical and projected future costs of existing regulations. Like all survey data, it is subject to sampling errors as well as possible intentional or unintentional misinterpretation of the questions or misrepresentation of the answers by respondents. Such sources of potential error could result in either upward or downward biases, and are not well understood.

8.2.1.2. Cost Estimates for the Clean Air Act Amendments

The cost estimates for the Clean Air Act amendments now being considered by Congress are particularly uncertain because they are based on EPA estimates for the Administration's proposed bill. It is difficult to accurately estimate costs for such a complex bill; the estimates are thus highly uncertain. Moreover, the provisions included in any final Clean Air Act amendments eventually passed by Congress may differ substantially from the provisions included in the Administration's bill.

8.2.1.3. Capital Amortization Rate

Another important factor influencing the point estimates for annualized costs is the amortization rate used to annualized capital costs. There currently is no consensus regarding the appropriate rate for amortizing pollution control capital costs. While the discussion of annualized costs focuses on those derived using the seven percent rate, all of the cost tables in this report show estimates calculated using three different rates: three, seven, and ten percent. This is done to show the sensitivity of the cost estimates to other assumptions regarding the appropriate rate for amortizing capital costs.

8.2.2. Factors Contributing to Downward Bias

8.2.2.1. Exclusion of Pre-1972 Capital Costs

This report did not include pre-1972 capital costs in the final cost estimates because such data are available only for private sector water and stationary source air pollution control costs. It was thought that inclusion of pre-1972 capital costs for these two categories and not for others would produce uneven estimates across environmental media and economic sectors. In order to build a consistent set of cost estimates, capital costs that were incurred prior to 1972 have been excluded from the final estimates. This has the effect of reducing the annualized cost estimates over the first half of the time period covered in this report.

Table 8-14 shows the size of this effect for private stationary source air and private water costs, assuming capital lives of 20 and 30 years, respectively. The estimates are calculated using capital cost data (shown in Table 8-13) and operating costs taken from the Commerce Department survey data for years 1959 through 1988. One complication is that the 1959 capital cost data represents the total pollution control capital stock as of that date. To assume that all pre-1960 capital investments were made in 1959, as Table 8-14 does, overstates annualized costs in later years since much of the 1959 total was actually made in earlier years and presumably would be retired sooner than the estimates show. Keeping this qualification in mind, lines 3 and 6 of Table 8-14 show the amount that should be added to air and water costs to account for pre-1972 capital investments. Including pre-1972 capital costs increases annualized costs for air and water programs by $2.2 and $1.8 billion, respectively, until the earliest capital is retired. Retirement of pre-1972 capital stock is assumed to begin in 1979 for air capital, and in 1989 for water capital. After these years, the additions to annualized costs due to inclusion of pre-1972 capital begins to fall annually.

8.2.2.2. Exclusion of Certain Costs

Although the cost estimate presented here are much more comprehensive than those included in earlier reports in this series, there are a number of programs and regulations for which little or no data are readily available, and are thus not included in this report. In general, the programs and regulations excluded are relatively small and their omission probably results in only a negligible downward bias in total costs. One example is the program directed to noise control. At the regulation level, most new and forthcoming rules for which there are no Regulatory Impact Analyses (RIAs) or similar reports are excluded. A partial list of excluded regulations can be found at the end of each major section of Appendix A.

8.2.3. Factors Contributing to Upward Bias

8.2.3.1. Actual Costs Often Below *Ex Ante* Estimates

At least one study of *ex ante* estimates of costs for new and proposed environmental regulations concludes that such studies have tended to over-estimate actual costs.[4] One reason for this is that *ex ante* estimates are often based on assumptions of "end-of-pipe" treatment rather than changes in production processes; the latter are often a less costly means of achieving compliance. Also, cost estimations usually assume full compliance in accordance with the current EPA plans for regulatory development and promulgation; however, some regulated entities typically go out of business before adopting controls or do not comply fully with regulatory requirements. If the historical tendency to over-estimate regulatory costs applies to the data for new regulations obtained from the Regulatory Impact Analyses (RIAs) used for this report, the cost estimates for new and forthcoming regulations included here may over-estimate actual costs. On the other hand, both EPA and the Office of Management and Budget have issued detailed guidelines for preparing RIAs in recent years, and these may have resulted in a more consistent and careful preparation of cost estimates than those studied earlier.

8.2.3.2. Cost Projections for Existing Programs

As explained in Section 1.3.2.1, costs associated with existing regulations are projected to the year 2000 by linearly extrapolating recent trends in historical costs. In the case of those categories for which costs in recent years have been increasing rapidly because of program changes, there is a risk that linear extrapolations of costs may overestimate total costs when these projections are added to the costs associated with new and forthcoming rules. Since air and water costs have been relatively stable over the 1980s, this seems unlikely to be a major problem in these two media. This is more of a potential problem in the case of land costs, given the passage of new legislation in this area during the 1980s. Within the land category, the principal category of potential concern is the hazardous waste program, for which costs went from zero in 1980 to over $1.4 billion in 1987. Comparison of the cost projections made for hazardous waste with projections made for the much older solid waste program suggests that hazardous waste expenditures for existing regulations are predicted to increase no faster than those for solid waste, however. Despite this encouraging result, there may be some small degree of upward bias in the cost estimates for hazardous waste regulation.

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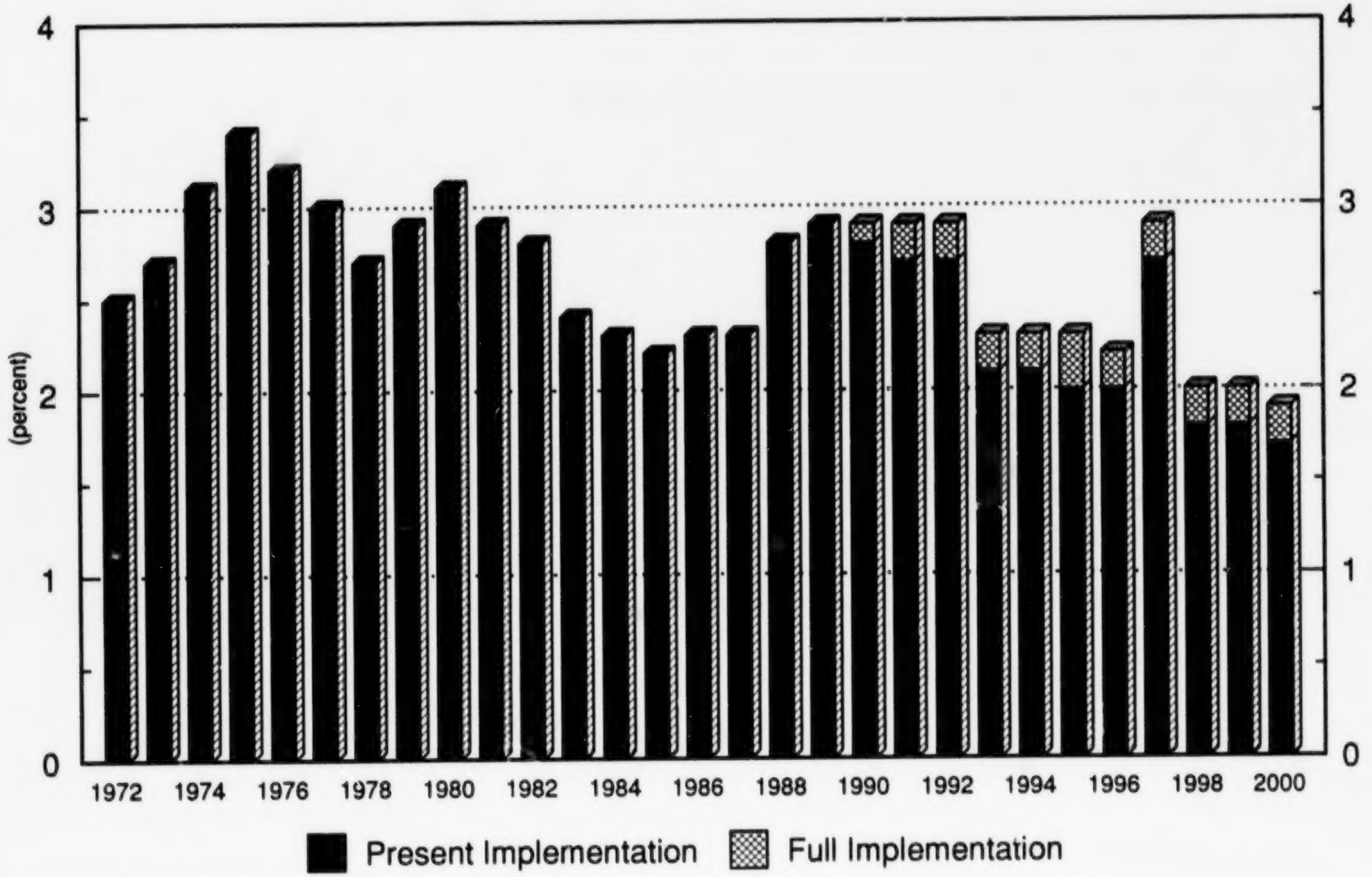
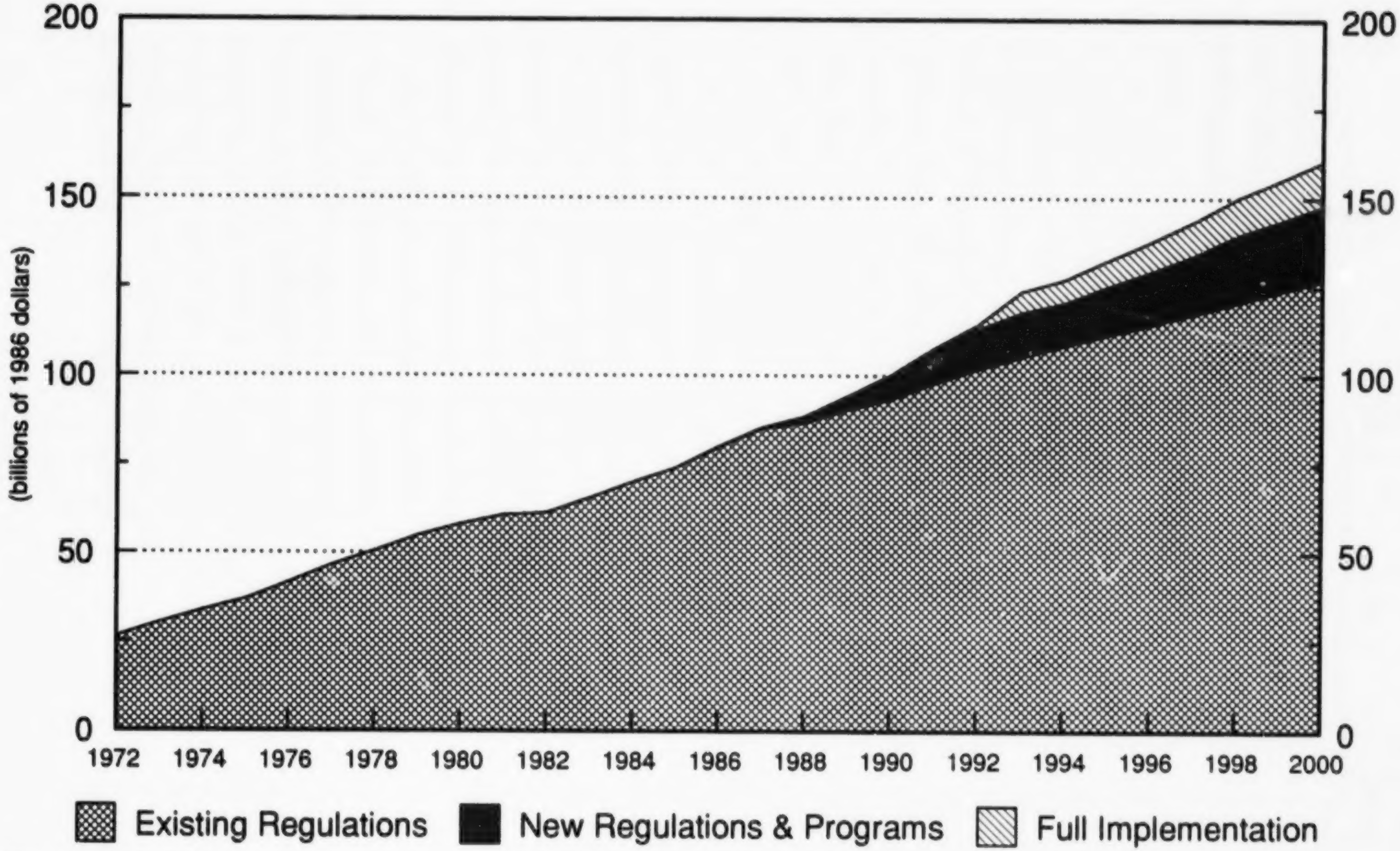
[4] Putnam, Hayes and Bartlett, Inc., *Comparisons of Estimated and Actual Pollution Control Capital Expenditures for Selected Industries*, Report for U.S. EPA Office of Planning and Evaluation, June 1980.

Fig. 8-1: ENVIRONMENTAL CAPITAL INVESTMENT AS A PERCENTAGE OF TOTAL CAPITAL INVESTMENT



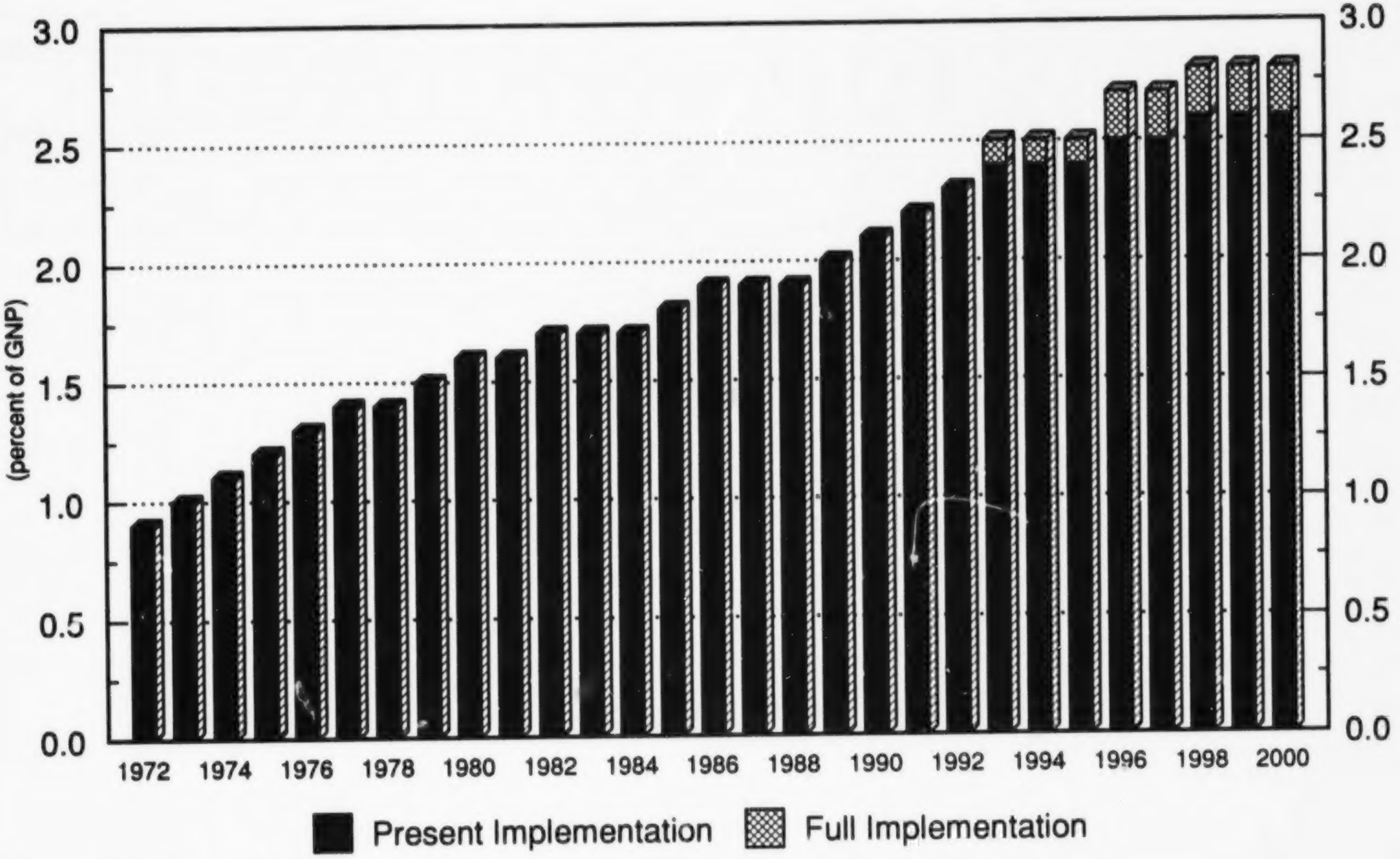
Source: Tables 8-1 and 8-4

Fig. 8-2: TOTAL ANNUALIZED COSTS BY TYPE OF REGULATION



Source: Table 8-17

Fig. 8-3: TOTAL ANNUALIZED COSTS AS A PERCENTAGE OF GNP



Source: Tables 8-3 and 8-6

Fig. 8-4: PERCENT CHANGE IN ANNUALIZED COSTS FROM PREVIOUS YEAR ASSUMING FULL IMPLEMENTATION AND 7% INTEREST

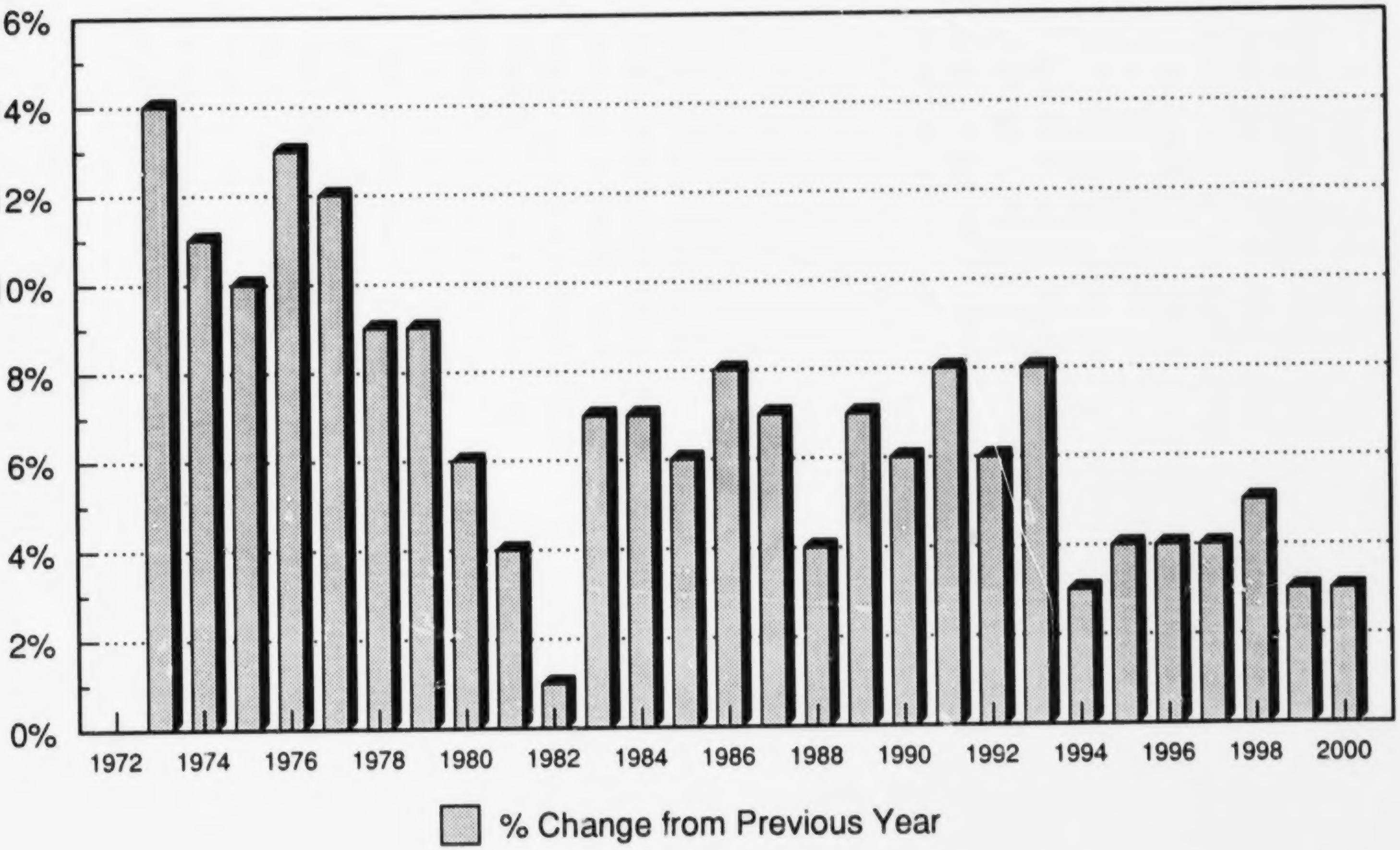
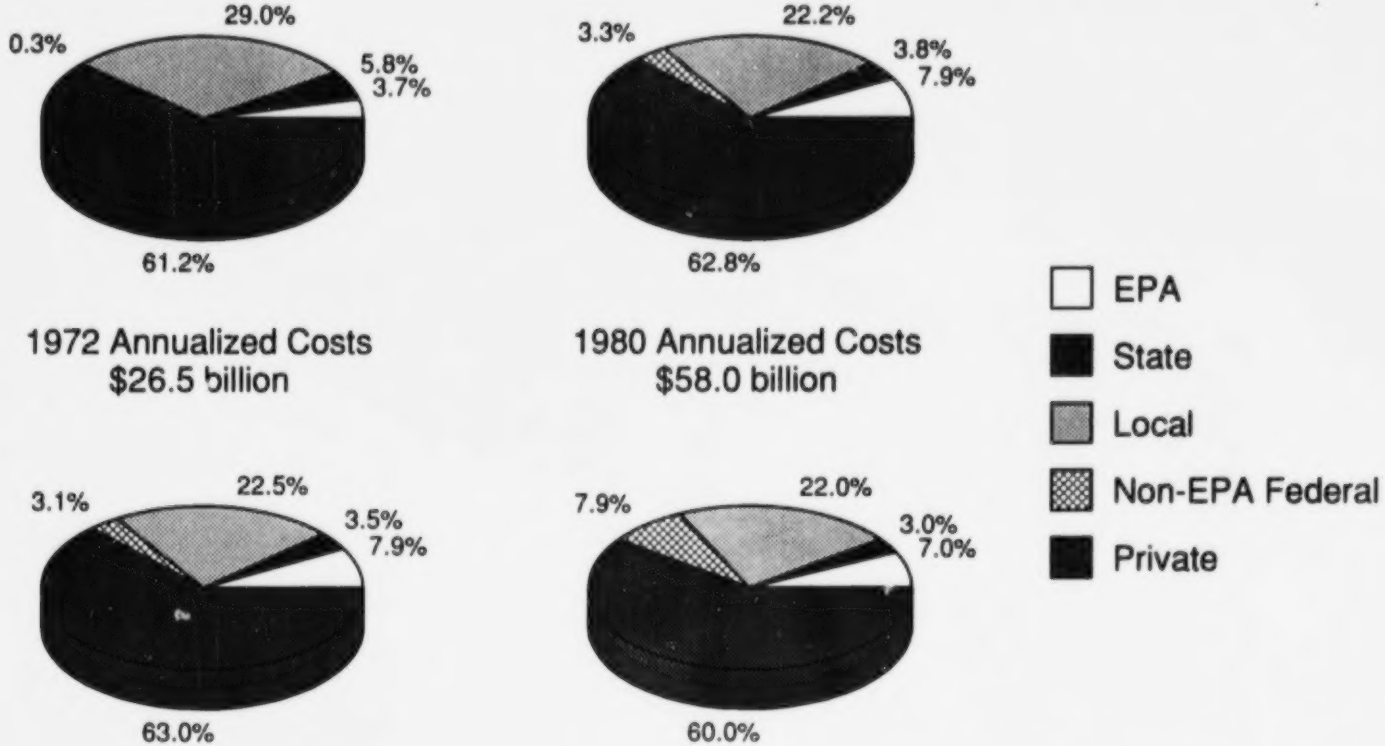


Fig. 8-5: TOTAL ANNUALIZED COSTS BY FUNDING SOURCE ASSUMING PRESENT IMPLEMENTATION AND 7% INTEREST



1972 Annualized Costs
$26.5 billion

1980 Annualized Costs
$58.0 billion

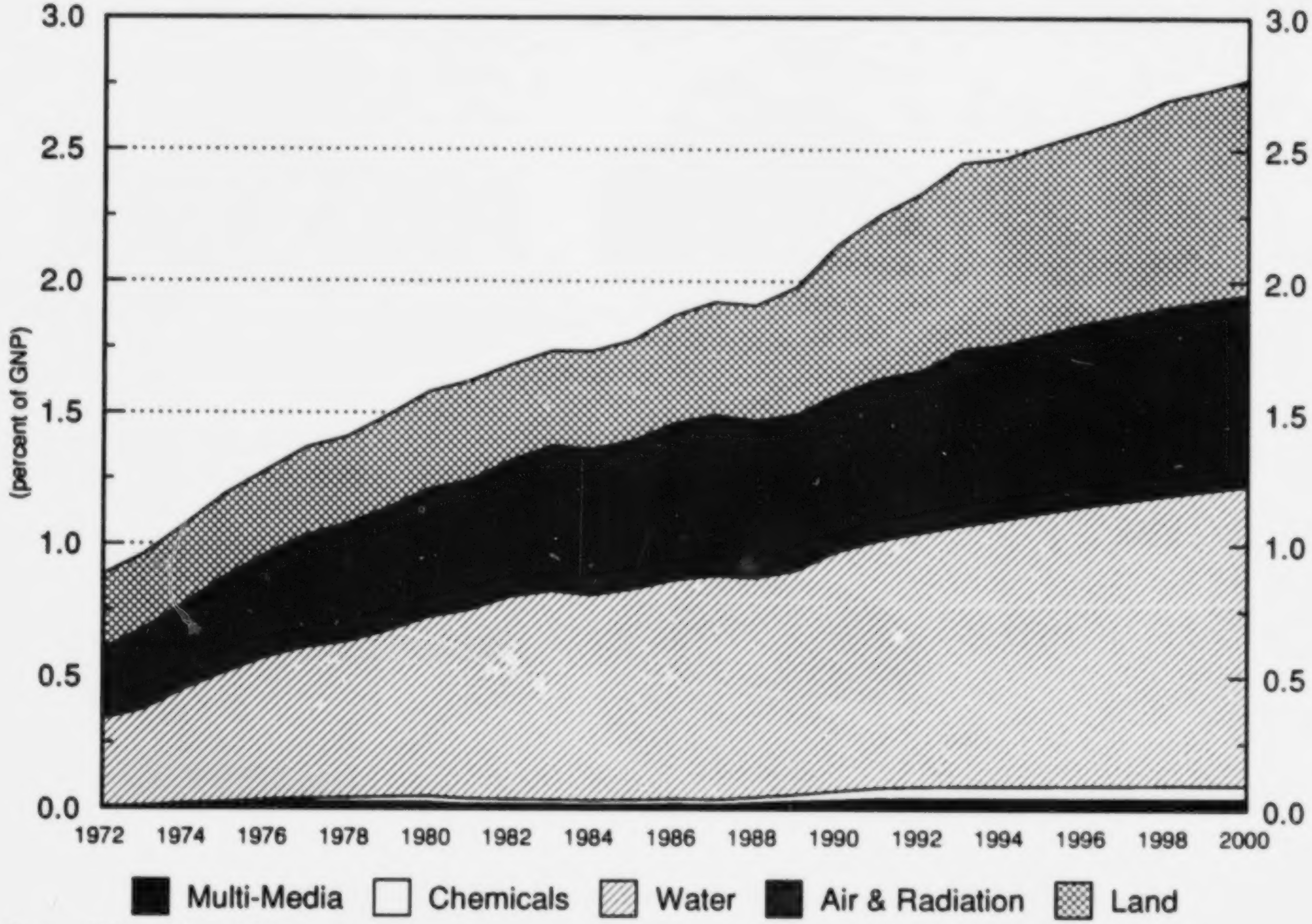
1987 Annualized Costs
$85.3 billion

2000 Annualized Costs
$147.9 billion

Source: Tables 8-12 and 8-12A

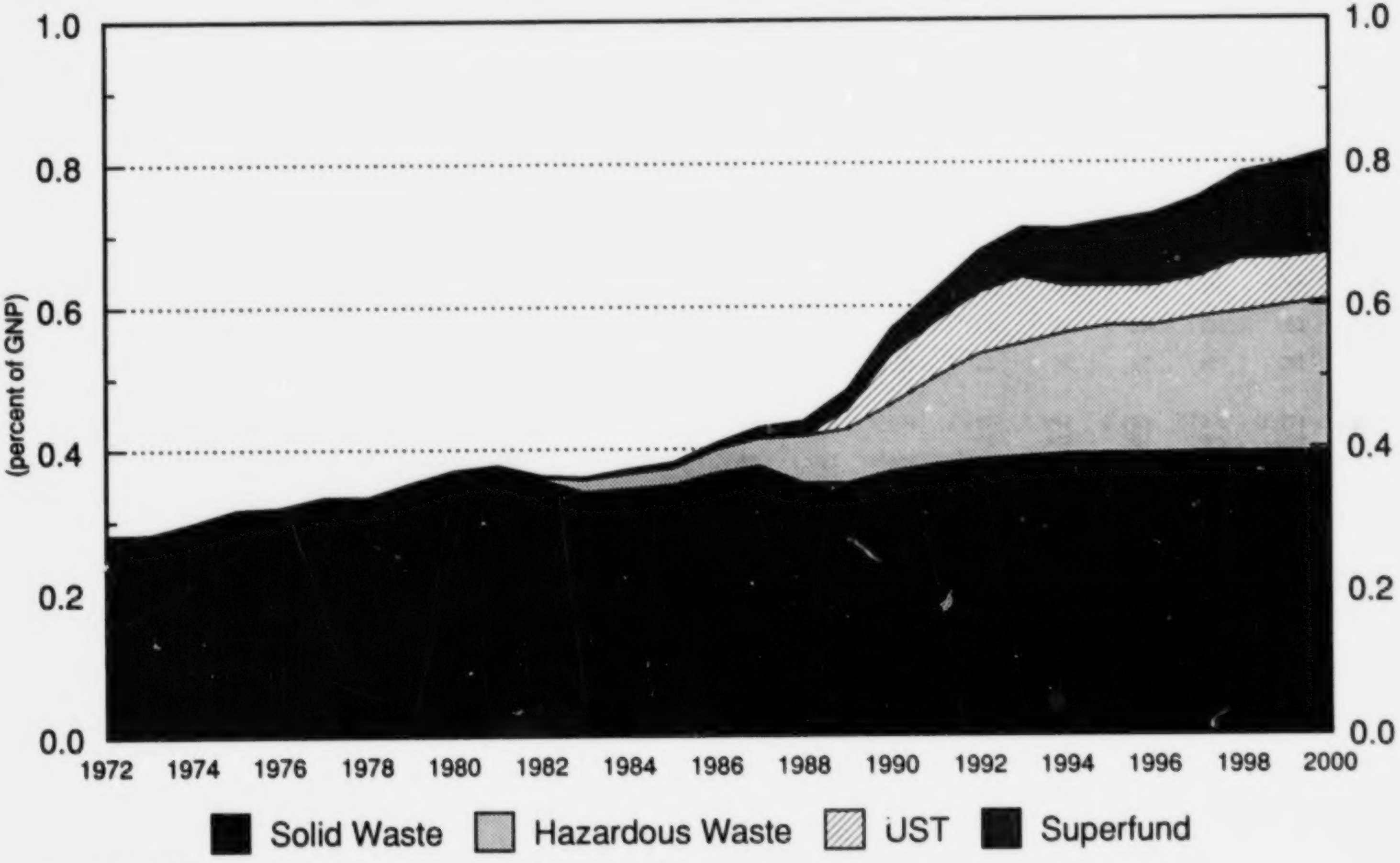
Fig. 8-6: TOTAL ANNUALIZED COSTS BY MEDIUM AS A PERCENTAGE OF GNP

(Assuming Full Implementation)



Source: Tables 8-3 and 8-6

Fig. 8-7: TOTAL LAND COSTS AS A PERCENTAGE OF GNP



Source: Table 5-3A

Table 8-1: TOTAL CAPITAL COSTS ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
3.2	Radiation			24	20	16	8	25	22	64	89	30	37	33	55	48
3.3	Total Air & Radiation	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,373
4	Water															
4.1	Water Quality	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,090	15,020	13,211	12,666	12,345	12,043	12,023	12,666
4.2	Drinking Water	736	772	868	917	895	814	825	979	1,081	1,060	1,016	935	915	1,073	1,251
4.3	Total Water	13,457	13,533	14,019	14,647	14,953	16,420	15,720	16,070	16,101	14,270	13,682	13,280	12,958	13,096	13,917
5	Land															
5.1	Solid Waste	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,591	1,848	1,912	2,115
5.2	Hazardous Waste												65	113	368	558
5.3	LUST															
5.4	RCRA	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,656	1,961	2,280	2,672
5.5	Superfund										42	193	293	648	748	713
5.6	Total Land	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,942	1,893	1,949	2,609	3,028	3,385
6	Chemicals															
6.1	Toxic Substances						2	48	83	27	17	59	31	136	153	162
6.2	Pesticides															
6.3	Total Chemicals						2	48	83	27	17	59	31	136	153	162
7	Multi-Media				4	19	45	13	42	68	120	76	79	109	84	46
8	Total Costs	20,225	22,451	23,105	26,297	26,600	28,178	27,484	28,825	28,715	27,036	25,870	25,113	26,864	27,656	28,884
8.1	% of Total Capital Inv	2.5	2.7	3.1	3.4	3.2	3.0	2.7	2.9	3.1	2.9	2.8	2.4	2.3	2.2	2.3

Footnotes to Table 8-1

Total capital costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding capital tables (those ending in "-1") in each media chapter, starting with Table 3-1 and ending with Table 7-1.

% of Total Capital Inv.: Total capital expenditures for pollution control expressed as a percentage of total capital investment in this country. Total capital investment in this country is defined as fixed private investment plus fixed government investment plus consumer investment in durable goods. Total capital private investment and consumer investment in durable goods from *Survey of Current Business*, Department of Commerce, Bureau of Economic Analysis, September 1989. Fixed government investment from unpublished documents from Department of Commerce, Bureau of Economic Analysis.

Table 8-1A: TOTAL CAPITAL COSTS ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981
3.2	Radiation	48	60	90	145	151	171	171	180	190	201	210	220	230	240	251
3.3	Total Air & Radiation	11,373	11,628	11,714	11,337	10,940	11,051	11,076	11,057	11,126	11,171	11,165	11,215	11,218	11,225	11,232
4	Water															
4.1	Water Quality	12,666	13,132	11,543	11,264	11,169	10,716	10,282	9,623	9,112	8,631	8,584	8,537	8,491	8,444	8,397
4.2	Drinking Water	1,251	1,220	1,185	1,223	1,253	1,575	2,083	2,416	2,645	2,976	3,096	2,690	1,993	1,602	1,615
4.3	Total Water	13,917	14,352	12,728	12,487	12,422	12,291	12,366	12,039	11,756	11,607	11,680	11,227	10,483	10,046	10,012
5	Land															
5.1	Solid Waste	2,115	2,169	1,983	1,998	2,012	4,132	4,648	3,435	3,449	3,464	2,976	2,991	3,005	3,020	3,034
5.2	Hazardous Waste	558	502	1,772	2,449	2,929	2,345	4,002	3,952	4,529	4,081	4,222	4,731	4,092	4,154	4,215
5.3	LUST				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
5.4	RCRA	2,672	2,671	3,755	9,697	10,192	12,574	13,901	12,637	8,434	8,001	7,654	8,178	18,853	7,273	7,349
5.5	Superfund	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
5.6	Total Land	3,385	4,133	5,653	12,478	13,047	16,142	18,796	18,137	14,303	14,188	13,920	14,680	25,599	14,251	14,572
6	Chemicals															
6.1	Toxic Substances	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
6.2	Pesticides															
6.3	Total Chemicals	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
7	Multi-Media	46	43	1,899	395	1,534	5									
8	Total Costs	28,884	30,313	32,151	37,670	38,921	40,473	43,227	41,398	37,268	37,053	36,858	37,220	47,404	35,633	35,932
8.1	% of Total Capital Inv	2.3	2.3	2.8	2.9	2.8	2.7	2.7	2.1	2.1	2	2	2.7	1.8	1.8	1.7

Footnotes to Table 8-1A

Total capital costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding capital tables in each media chapter (Tables 3-1A, 3-1B, 4-1, 5-1A, 5-1B, 6-1A, and 7-1A).

% of Total Capital Inv.: Total capital expenditures for pollution control expressed as a percentage of total capital investment in this country. Total capital investment in this country is defined as fixed private investment plus fixed government investment plus consumer investment in durable goods. Sources: Fixed private investment and consumer investment in durable goods from *Survey of Current Business*, Department of Commerce, Bureau of Economic Analysis, September 1989. Fixed government investment from unpublished documents from Department of Commerce, Bureau of Economic Analysis.

Table 8-2: TOTAL OPERATING COSTS ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
3.2	Radiation	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
3.3	Total Air & Radiation	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045
4	Water															
4.1	Water Quality	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,121	12,526	13,026	13,191	13,976	14,413	15,119	16,109
4.2	Drinking Water	732	741	774	824	899	979	1,073	1,180	1,238	1,353	1,417	1,442	1,471	1,549	1,645
4.3	Total Water	8,817	9,288	10,102	10,596	11,672	12,309	12,717	13,301	13,764	14,379	14,608	15,419	15,884	16,668	17,753
5	Land															
5.1	Solid Waste	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,356	11,260	10,947	11,830	12,344	13,254
5.2	Hazardous Waste										182	147	677	828	958	1,306
5.3	LUST															
5.4	RCRA	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,538	11,407	11,624	12,658	13,301	14,561
5.5	Superfund										12	40	69	140	157	191
5.6	Total Land	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,550	11,447	11,693	12,798	13,458	14,752
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	154	332	414	350	293	212	207	251	335
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	578	840	874	774	690	585	647	721	754
7	Multi-Media	108	139	461	587	726	913	896	875	850	665	570	648	603	625	851
8	Total Costs	24,735	26,545	27,876	28,678	30,936	33,258	34,666	36,303	36,767	36,768	35,046	36,939	38,800	40,538	44,155

Footnotes to Table 8-2

Total operating costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding operating cost tables (those ending in "-2") in each media chapter, starting with Table 3-2 and ending with Table 7-2.

Table 8-2A: TOTAL OPERATING COSTS ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	9,731	10,427	10,083	9,916	8,823	9,480	9,863	10,287	10,772	12,408	13,923	15,134	16,449	17,410	18,832
3.2	Radiation	314	281	300	330	362	389	417	445	473	502	530	558	587	615	644
3.3	Total Air & Radiation	10,045	10,708	10,383	10,246	9,185	9,869	10,280	10,732	11,245	12,910	14,453	15,692	17,035	18,025	19,476
4	Water															
4.1	Water Quality	16,109	17,085	16,975	17,674	18,432	19,237	19,747	20,334	20,888	21,442	21,996	22,550	23,104	23,658	24,212
4.2	Drinking Water	1,645	1,661	1,689	1,738	1,792	1,982	2,248	2,360	2,523	2,761	2,888	2,976	3,181	3,349	3,379
4.3	Total Water	17,753	18,746	18,664	19,412	20,224	21,219	21,995	22,694	23,411	24,203	24,884	25,526	26,285	27,007	27,591
5	Land															
5.1	Solid Waste	13,254	14,035	13,463	13,738	14,012	14,482	14,832	15,227	15,622	15,895	16,169	16,442	16,716	16,989	17,263
5.2	Hazardous Waste	1,306	1,574	2,758	3,043	3,576	4,780	5,790	6,077	6,390	6,599	6,386	6,676	6,940	7,203	7,430
5.3	LUST		1	13	888	2,368	2,379	2,416	2,427	1,066	662	672	683	694	387	397
5.4	RCRA	14,561	15,610	16,234	17,668	19,956	21,640	23,038	23,731	23,077	23,156	23,227	23,801	24,349	24,580	25,090
5.5	Superfund	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
5.6	Total Land	14,752	15,963	16,681	18,309	20,723	22,539	24,235	25,107	24,591	24,812	24,984	25,696	26,387	26,766	27,432
6	Chemicals															
6.1	Toxic Substances	335	283	358	369	318	425	492	608	613	619	666	674	683	692	700
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	754	736	813	1,066	1,297	1,510	1,662	1,865	1,917	1,972	2,072	2,140	2,199	2,273	2,358
7	Multi-Media	851	772	930	1,196	1,172	1,563	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883
8	Total Costs	44,155	46,925	47,470	50,228	52,601	56,701	59,729	61,992	62,797	65,567	68,101	70,805	73,701	75,911	78,740

Footnotes to Table 8-2A

Total operating costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding operating cost tables in each media chapter (Tables 3-2A, 3-2B, 4-2A, 5-2A, 5-2B, 6-2A, and 7-2A).

Table 8-3: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
3.2	Radiation	18	17	255	232	158	173	237	232	219	201	220	207	215	233	355
3.3	Total Air & Radiation	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431
4	Water															
4.1	Water Quality	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,147	22,763	24,328	25,514	27,294	28,700	30,376	32,386
4.2	Drinking Water	802	883	998	1,135	1,294	1,451	1,623	1,823	1,982	2,198	2,357	2,471	2,586	2,765	2,979
4.3	Total Water	9,912	11,484	13,439	15,126	17,419	19,391	21,078	22,970	24,745	26,525	27,871	29,765	31,286	33,141	35,365
5	Land															
5.1	Solid Waste	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	13,934	12,998	12,835	13,892	14,587	15,697
5.2	Hazardous Waste										182	147	683	845	1,009	1,410
5.3	LUST															
5.4	RCRA	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,116	13,145	13,518	14,737	15,596	17,107
5.5	Superfund										15	59	112	235	312	404
5.6	Total Land	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,131	13,204	13,630	14,972	15,908	17,511
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	158	345	429	367	315	237	245	303	402
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	583	853	889	791	712	610	685	773	822
7	Multi-Media	108	139	461	587	729	919	903	886	868	695	606	692	657	687	918
8	Total Costs	26,481	30,261	33,614	36,842	41,572	46,509	50,482	54,824	57,969	60,539	61,237	65,477	69,925	74,021	80,046
8.1	Percentage of GNP	0.88	0.96	1.07	1.19	1.28	1.37	1.41	1.49	1.58	1.62	1.68	1.74	1.74	1.78	1.87

Footnotes to Table 8-3

Total operating costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding seven percent annualized cost tables (those ending in "-3") in each section, starting with Table 3-3 and ending with Table 7-3.

Table 8-3A: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	25,077	26,679	27,238	27,872	27,588	29,005	29,692	30,160	30,507	31,904	33,200	34,265	35,424	36,237	37,495
3.2	Radiation	355	327	353	396	441	483	525	568	613	659	705	752	800	847	896
3.3	Total Air & Radiation	25,431	27,006	27,591	28,267	28,029	29,488	30,217	30,728	31,120	32,562	33,905	35,017	36,224	37,085	38,390
4	Water															
4.1	Water Quality	32,386	34,421	35,241	36,847	38,506	40,174	41,513	42,875	44,164	45,413	46,659	47,901	49,139	50,374	51,605
4.2	Drinking Water	2,979	3,111	3,250	3,415	3,587	3,926	4,319	4,586	4,917	5,350	5,684	5,949	6,264	6,491	6,571
4.3	Total Water	35,365	37,531	38,491	40,262	42,092	44,100	45,831	47,461	49,080	50,763	52,343	53,850	55,403	56,865	58,176
5	Land															
5.1	Solid Waste	15,697	16,683	16,298	16,761	17,226	18,085	18,747	19,322	19,884	20,338	20,744	21,142	21,539	21,922	22,302
5.2	Hazardous Waste	1,410	1,725	3,077	3,593	4,402	5,827	7,216	7,875	8,616	9,210	9,396	10,133	10,782	11,438	12,062
5.3	LUST		1	13	1,311	3,215	3,716	4,177	4,611	3,286	2,920	2,966	3,014	3,972	3,673	3,691
5.4	RCRA	17,107	18,409	19,388	21,664	24,842	27,629	30,139	31,808	31,787	32,468	33,106	34,289	36,293	37,033	38,055
5.5	Superfund	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
5.6	Total Land	17,511	19,092	20,318	23,013	26,547	29,753	32,956	35,247	35,836	37,158	38,402	40,247	42,938	44,388	46,148
6	Chemicals															
6.1	Toxic Substances	402	365	456	558	600	799	960	1,091	1,104	1,119	1,174	1,192	1,206	1,217	1,234
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	822	819	910	1,255	1,579	1,885	2,130	2,348	2,408	2,472	2,580	2,657	2,721	2,799	2,892
7	Multi-Media	918	842	1,180	1,483	1,603	1,995	1,989	2,027	2,065	2,102	2,138	2,177	2,220	2,260	2,298
8	Total Costs	80,046	85,290	88,490	94,280	99,850	107,221	113,123	117,811	120,510	125,056	129,368	133,948	139,507	143,396	147,904
8.1	Percentage of GNP	1.87	1.92	1.91	1.98	2.13	2.24	2.32	2.37	2.37	2.42	2.45	2.49	2.55	2.58	2.61

Footnotes to Table 8-3A

Total operating costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding seven percent annualized cost tables in each media chapter (Tables 3-3A, 3-3B, 4-3A, 5-3A, 5-3B, 6-3A, and 7-3A).

Table 8-3B: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
3.2	Radiation	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
3.3	Total Air & Radiation	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755
4	Water															
4.1	Water Quality	8,734	9,847	11,299	12,443	14,161	15,515	16,589	17,835	19,007	20,181	20,993	22,408	23,458	24,778	26,414
4.2	Drinking Water	782	842	933	1,046	1,181	1,315	1,465	1,638	1,768	1,955	2,087	2,175	2,265	2,415	2,595
4.3	Total Water	9,516	10,689	12,233	13,489	15,342	16,830	18,054	19,473	20,775	22,136	23,079	24,582	25,723	27,193	29,009
5	Land															
5.1	Solid Waste	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,480	12,498	12,292	13,298	13,941	14,994
5.2	Hazardous Waste										182	147	681	840	994	1,380
5.3	LUST															
5.4	RCRA	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,662	12,645	12,973	14,139	14,935	16,374
5.5	Superfund										14	52	96	200	255	326
5.6	Total Land	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,676	12,697	13,069	14,339	15,190	16,700
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	157	341	425	362	309	229	234	288	383
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	581	849	885	786	705	603	674	758	802
7	Multi-Media	108	139	461	587	728	917	901	883	863	686	596	679	642	669	898
8	Total Costs	25,901	29,042	31,737	34,222	38,203	42,344	45,542	49,072	51,408	53,221	53,200	56,751	60,462	63,860	69,164
8.1	Percentage of GNP	0.86	0.92	1.01	1.10	1.17	1.24	1.27	1.34	1.40	1.42	1.46	1.50	1.50	1.53	1.62

Footnotes to Table 8-3B

Total annualized costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3C, 4-3B, 5-3C, 6-3B, and 7-3B).

Table 8-3C: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	21,414	22,804	23,154	23,598	23,128	24,369	25,016	25,509	25,916	27,396	28,767	29,892	31,113	31,993	33,322
3.2	Radiation	341	312	335	374	415	452	489	528	567	607	647	688	730	770	812
3.3	Total Air & Radiation	21,755	23,116	23,490	23,972	23,543	24,821	25,505	26,036	26,483	28,002	29,414	30,580	31,843	32,764	34,134
4	Water															
4.1	Water Quality	26,414	28,060	28,539	29,812	31,141	32,492	33,527	34,605	35,624	36,618	37,610	38,600	39,587	40,572	41,554
4.2	Drinking Water	2,595	2,693	2,801	2,932	3,070	3,367	3,723	3,945	4,228	4,604	4,879	5,093	5,376	5,586	5,652
4.3	Total Water	29,009	30,754	31,340	32,745	34,211	35,858	37,249	38,550	39,851	41,222	42,489	43,693	44,963	46,158	47,206
5	Land															
5.1	Solid Waste	14,994	15,920	15,482	15,890	16,300	17,048	17,619	18,143	18,657	19,059	19,427	19,789	20,150	20,502	20,851
5.2	Hazardous Waste	1,380	1,681	2,985	3,435	4,164	5,526	6,805	7,358	7,975	8,458	8,529	9,138	9,676	10,219	10,728
5.3	LUST		1	13	1,155	2,904	3,226	3,531	3,809	2,471	2,091	2,124	2,158	2,769	2,468	2,483
5.4	RCRA	16,374	17,603	18,480	20,480	23,369	25,799	27,956	29,310	29,104	29,609	30,080	31,085	32,595	33,188	34,062
5.5	Superfund	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
5.6	Total Land	16,700	18,165	19,233	21,569	24,729	27,474	30,178	31,992	32,223	33,186	34,078	35,552	37,550	38,647	40,045
6	Chemicals															
6.1	Toxic Substances	383	341	428	504	519	691	825	952	962	975	1,028	1,043	1,055	1,066	1,080
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	802	795	882	1,200	1,498	1,777	1,995	2,209	2,267	2,328	2,434	2,508	2,571	2,647	2,738
7	Multi-Media	898	822	1,108	1,400	1,479	1,871	1,865	1,902	1,940	1,978	2,014	2,055	2,098	2,139	2,178
8	Total Costs	69,164	73,652	76,052	80,887	85,459	91,801	96,792	100,690	102,764	106,716	110,430	114,388	119,025	122,355	126,302
8.1	Percentage of GNP	1.62	1.66	1.64	1.70	1.83	1.92	1.98	2.02	2.02	2.06	2.09	2.13	2.18	2.20	2.23

Footnotes to Table 8-3C

Total annualized costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3D, 3-3E, 4-3C, 5-3D, 5-3E, 6-3C, and 7-3C).

Table 8-3D: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
3.2	Radiation	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
3.3	Total Air & Radiation	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505
4	Water															
4.1	Water Quality	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,003	26,001	27,903	29,412	31,506	33,220	35,202	37,535
4.2	Drinking Water	819	918	1,053	1,211	1,391	1,567	1,758	1,980	2,164	2,404	2,587	2,722	2,858	3,062	3,305
4.3	Total Water	10,253	12,168	14,479	16,537	19,209	21,598	23,683	25,983	28,165	30,307	31,999	34,229	36,079	38,264	40,840
5	Land															
5.1	Solid Waste	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,319	13,423	13,297	14,396	15,135	16,294
5.2	Hazardous Waste										182	147	684	849	1,022	1,436
5.3	LUST															
5.4	RCRA	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,502	13,570	13,981	15,246	16,156	17,730
5.5	Superfund										16	65	125	265	361	471
5.6	Total Land	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,518	13,635	14,106	15,510	16,518	18,200
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	159	348	433	371	321	243	254	316	419
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	584	856	893	795	717	616	694	786	838
7	Multi-Media	108	139	461	587	729	921	905	889	873	702	615	702	671	702	934
8	Total Costs	26,978	31,305	35,222	39,082	44,451	50,067	54,699	59,732	63,566	66,781	68,091	72,916	77,988	82,679	89,318
8.1	Percentage of GNP	0.90	0.99	1.12	1.26	1.37	1.47	1.53	1.63	1.73	1.79	1.87	1.93	1.94	1.99	2.09

Footnotes to Table 8-3D

Total annualized costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3F, 4-3D, 5-3F, 6-3D, and 7-3D).

Table 8-3E: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION AT ANNUALIZED 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	28,139	29,918	30,651	31,444	31,315	32,880	33,598	34,041	34,337	35,662	36,894	37,905	39,011	39,767	40,962
3.2	Radiation	366	340	368	414	463	509	555	603	653	703	755	807	861	913	967
3.3	Total Air & Radiation	28,505	30,258	31,019	31,858	31,778	33,389	34,153	34,645	34,989	36,365	37,648	38,712	39,872	40,680	41,929
4	Water															
4.1	Water Quality	37,535	39,905	41,019	42,912	44,856	46,797	48,398	50,006	51,527	52,996	54,461	55,920	57,375	58,825	60,270
4.2	Drinking Water	3,305	3,465	3,632	3,825	4,025	4,401	4,825	5,130	5,502	5,982	6,367	6,676	7,017	7,259	7,351
4.3	Total Water	40,840	43,370	44,651	46,737	48,881	51,198	53,223	55,136	57,028	58,978	60,828	62,596	64,393	66,084	67,621
5	Land															
5.1	Solid Waste	16,294	17,330	16,991	17,500	18,011	18,966	19,703	20,322	20,926	21,424	21,862	22,291	22,718	23,127	23,533
5.2	Hazardous Waste	1,436	1,762	3,155	3,727	4,604	6,083	7,564	8,315	9,160	9,848	10,131	10,977	11,721	12,473	13,194
5.3	LUST		1	13	1,444	3,482	4,140	4,734	5,301	3,988	3,634	3,692	3,751	5,008	4,713	4,733
5.4	RCRA	17,730	19,093	20,159	22,671	26,097	29,189	32,001	33,939	34,075	34,906	35,685	37,019	39,448	40,313	41,461
5.5	Superfund	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
5.6	Total Land	18,200	19,881	21,242	24,244	28,098	31,700	35,330	38,030	38,927	40,556	42,101	44,263	47,550	49,303	51,373
6	Chemicals															
6.1	Toxic Substances	419	385	480	605	669	891	1,074	1,209	1,224	1,241	1,298	1,318	1,333	1,345	1,364
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	838	839	934	1,301	1,648	1,976	2,244	2,466	2,528	2,594	2,705	2,783	2,849	2,927	3,022
7	Multi-Media	934	860	1,241	1,553	1,709	2,101	2,095	2,133	2,170	2,208	2,243	2,282	2,324	2,363	2,399
8	Total Costs	89,318	95,206	99,086	105,693	112,114	120,364	127,045	132,410	135,643	140,700	145,525	150,636	156,988	161,357	166,345
8.1	Percentage of GNP	2.09	2.15	2.14	2.22	2.39	2.52	2.60	2.66	2.67	2.72	2.76	2.80	2.87	2.90	2.94

Footnotes to Table 8-3E

Total annualized costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3G, 3-3H, 4-3E, 5-3G, 5-3H, 6-3E, and 7-3E).

Table 8-4: TOTAL CAPITAL COSTS ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981
3.2	Radiation	48	60	90	145	151	171	171	180	190	201	210	220	230	240	251
3.3	Total Air & Radiation	11,373	11,628	11,714	11,337	10,940	11,051	11,076	11,057	11,126	11,171	11,165	11,215	11,218	11,225	11,232
4	Water															
4.1	Water Quality	12,666	13,132	11,543	11,264	12,926	12,539	12,563	12,374	12,301	12,228	12,155	12,082	12,009	11,937	11,864
4.2	Drinking Water	1,251	1,220	1,185	1,223	1,253	1,575	2,083	2,416	2,645	2,976	3,096	2,690	1,993	1,602	1,615
4.3	Total Water	13,917	14,352	12,728	12,487	14,179	14,113	14,646	14,790	14,946	15,204	15,251	14,772	14,002	13,539	13,479
5	Land															
5.1	Solid Waste	2,115	2,169	1,983	1,998	2,012	4,132	4,648	3,435	3,449	3,464	2,976	2,991	3,005	3,020	3,034
5.2	Hazardous Waste	558	502	1,772	2,449	2,929	2,345	4,002	3,952	4,529	4,081	4,222	4,731	4,092	4,154	4,215
5.3	LUST				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
5.4	RCRA	2,672	2,671	3,755	9,697	10,192	12,574	13,901	12,637	8,434	8,001	7,654	8,178	18,853	7,273	7,349
5.5	Superfund	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
5.6	Total Land	3,385	4,133	5,653	12,478	13,047	16,142	18,796	18,137	14,303	14,188	13,920	14,680	25,599	14,251	14,572
6	Chemicals															
6.1	Toxic Substances	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
6.2	Pesticides															
6.3	Total Chemicals	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
7	Multi-Media	46	43	1,899	395	1,534	5									
8	Total Costs	28,884	30,313	32,151	37,670	40,678	42,295	45,507	44,150	40,457	40,650	40,429	40,765	50,923	39,126	39,398
8.1	% of Total Capital Inv	2.3	2.3	2.8	2.9	2.9	2.9	2.9	2.3	2.3	2.3	2.2	2.9	2.0	2.0	1.9

Footnotes to Table 8-4

Total capital costs for implementing existing and new regulations for all media for the years 1986-2000. Table includes costs incurred to achieve full implementation of existing regulations and are taken from the corresponding capital cost tables (those ending in "-1A or "-1B") in each prior section, starting with Table 3-1A and ending with Table 7-1A.

% of Total Capital Inv.: Total capital expenditures for pollution control expressed as a percentage of total capital investment in this country. Total capital investment in this country is defined as fixed private investment plus fixed government investment plus consumer investment in durable goods. Sources: Fixed private investment and consumer investment in durable goods from *Survey of Current Business*, Department of Commerce, Bureau of Economic Analysis, September 1989. Fixed government investment from unpublished documents from Department of Commerce, Bureau of Economic Analysis.

Table 8-5: TOTAL OPERATING COSTS ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	9,731	10,427	10,0[illegible]3	9,916	8,823	9,480	9,863	14,655	15,170	16,997	18,935	20,568	22,303	23,686	25,386
3.2	Radiation	314	281	30[illegible]	330	362	389	417	445	473	502	530	558	587	615	644
3.3	Total Air & Radiation	10,045	10,708	10,383	10,246	9,185	9,869	10,280	15,100	15,643	17,499	19,465	21,126	22,889	24,301	26,030
4	Water															
4.1	Water Quality	16,109	17,085	16,975	17,674	18,608	19,595	20,333	21,195	22,068	22,982	23,893	24,802	25,708	26,611	27,512
4.2	Drinking Water	1,645	1,661	1,689	1,738	1,792	1,982	2,248	2,360	2,523	2,761	2,888	2,976	3,181	3,349	3,379
4.3	Total Water	17,753	18,746	18,664	19,412	20,399	21,577	22,581	23,555	24,591	25,743	26,781	27,778	28,888	29,960	30,890
5	Land															
5.1	Solid Waste	13,254	14,035	13,463	13,738	14,012	14,482	14,832	15,227	15,622	15,895	16,169	16,442	16,716	16,989	17,263
5.2	Hazardous Waste	1,306	1,574	2,758	3,043	3,576	4,780	5,790	6,077	6,390	6,599	6,386	6,676	6,940	7,203	7,430
5.3	LUST		1	13	888	2,368	2,379	2,416	2,427	1,066	662	672	683	694	387	397
5.4	RCRA	14,561	15,610	16,234	17,668	19,956	21,640	23,038	23,731	23,077	23,156	23,227	23,801	24,349	24,580	25,090
5.5	Superfund	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
5.6	Total Land	14,752	15,963	16,681	18,309	20,723	22,539	24,235	25,107	24,591	24,812	24,984	25,696	26,387	26,766	27,432
6	Chemicals															
6.1	Toxic Substances	335	283	358	369	318	425	492	608	613	619	666	674	683	692	700
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	754	736	813	1,066	1,297	1,510	1,662	1,865	1,917	1,972	2,072	2,140	2,199	2,273	2,358
7	Multi-Media	851	772	930	1,196	1,172	1,563	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883
8	Total Costs	44,155	46,925	47,470	50,228	52,777	57,059	60,315	67,222	68,375	71,696	75,010	78,491	82,159	85,140	88,593

Footnotes to Table 8-5

Total operating costs for implementing existing and new regulations for all media for the years 1986-2000. Table includes costs incurred to achieve full implementation of existing regulations and are taken from the corresponding program totals of the corresponding operating cost tables (those ending in "-2A" and "-2B") in each section, starting with Table 3-2A and ending with Table 7-2A.

Table 8-6: TOTAL COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	25,077	26,679	27,238	27,872	27,588	29,005	29,692	34,528	34,905	36,493	38,212	39,699	41,278	42,513	44,049
3.2	Radiation	355	327	353	396	441	483	525	568	613	659	705	752	800	847	896
3.3	Total Air & Radiation	25,431	27,006	27,591	28,267	28,029	29,488	30,217	35,096	35,518	37,151	38,917	40,451	42,078	43,361	44,944
4	Water															
4.1	Water Quality	32,386	34,421	35,241	36,847	38,823	40,820	42,571	44,430	46,295	48,194	50,085	51,967	53,840	55,706	57,563
4.2	Drinking Water	2,979	3,111	3,250	3,415	3,587	3,926	4,319	4,586	4,917	5,350	5,684	5,949	6,264	6,491	6,571
4.3	Total Water	35,365	37,531	38,491	40,262	42,410	44,746	46,890	49,017	51,212	53,543	55,769	57,916	60,104	62,197	64,134
5	Land															
5.1	Solid Waste	15,697	16,683	16,298	16,761	17,226	18,085	18,747	19,322	19,884	20,338	20,744	21,142	21,539	21,922	22,302
5.2	Hazardous Waste	1,410	1,725	3,077	3,593	4,402	5,827	7,216	7,875	8,616	9,210	9,396	10,133	10,782	11,438	12,062
5.3	LUST		1	13	1,311	3,215	3,716	4,177	4,611	3,286	2,920	2,966	3,014	3,972	3,673	3,691
5.4	RCRA	17,107	18,409	19,388	21,664	24,842	27,629	30,139	31,808	31,787	32,468	33,106	34,289	36,293	37,033	38,055
5.5	Superfund	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
5.6	Total Land	17,511	19,092	20,318	23,013	26,547	29,753	32,956	35,247	35,836	37,158	38,402	40,247	42,938	44,388	46,148
6	Chemicals															
6.1	Toxic Substances	402	365	456	558	600	799	960	1,091	1,104	1,119	1,174	1,192	1,206	1,217	1,234
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	822	819	910	1,255	1,579	1,885	2,130	2,348	2,408	2,472	2,580	2,657	2,721	2,799	2,892
7	Multi-Media	918	842	1,180	1,483	1,603	1,995	1,989	2,027	2,065	2,102	2,138	2,177	2,220	2,260	2,298
8	Total Costs	80,046	85,290	88,490	94,280	100,167	107,867	114,181	123,735	127,039	132,426	137,806	143,447	150,062	155,004	160,416
8.1	Percentage of GNP	1.87	1.92	1.91	1.98	2.14	2.26	2.34	2.49	2.50	2.56	2.61	2.67	2.74	2.78	2.83

Footnotes to Table 8-6

Total annualized costs for implementing existing and new regulations for all media for the years 1986-2000. Table includes costs incurred to achieve full implementation of existing regulations and are taken from the corresponding program totals of the corresponding seven percent annualized cost tables in each media chapter (Tables 3-3A, 3-3B, 4-3A, 5-3A, 5-3B, 6-3A, and 7-3A).

Table 8-6A: TOTAL COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	21,414	22,804	23,154	23,598	23,128	24,369	25,016	29,877	30,314	31,985	33,779	35,326	36,967	38,269	39,876
3.2	Radiation	341	312	335	374	415	452	489	528	567	607	647	688	730	770	812
3.3	Total Air & Radiation	21,755	23,116	23,490	23,972	23,543	24,821	25,505	30,404	30,881	32,591	34,426	36,014	37,697	39,040	40,688
4	Water															
4.1	Water Quality	26,414	28,060	28,539	29,812	31,406	33,032	34,412	35,905	37,406	38,944	40,475	42,000	43,519	45,031	46,537
4.2	Drinking Water	2,595	2,693	2,801	2,932	3,070	3,367	3,723	3,945	4,228	4,604	4,879	5,093	5,376	5,586	5,652
4.3	Total Water	29,009	30,754	31,340	32,745	34,476	36,399	38,134	39,851	41,634	43,548	45,354	47,093	48,895	50,617	52,189
5	Land															
5.1	Solid Waste	14,994	15,920	15,482	15,890	16,300	17,048	17,619	18,143	18,657	19,059	19,427	19,789	20,150	20,502	20,851
5.2	Hazardous Waste	1,380	1,681	2,985	3,435	4,164	5,526	6,805	7,358	7,975	8,458	8,529	9,138	9,676	10,219	10,728
5.3	LUST		1	13	1,155	2,904	3,226	3,531	3,809	2,471	2,091	2,124	2,158	2,769	2,468	2,483
5.4	RCRA	16,374	17,603	18,480	20,480	23,369	25,799	27,956	29,310	29,104	29,609	30,080	31,085	32,595	33,188	34,062
5.5	Superfund	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
5.6	Total Land	16,700	18,165	19,233	21,569	24,729	27,474	30,178	31,992	32,223	33,186	34,078	35,552	37,550	38,647	40,045
6	Chemicals															
6.1	Toxic Substances	383	341	428	504	519	691	825	952	962	975	1,028	1,043	1,055	1,066	1,080
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	802	795	882	1,200	1,498	1,777	1,995	2,209	2,267	2,328	2,434	2,508	2,571	2,647	2,738
7	Multi-Media	898	822	1,108	1,400	1,479	1,871	1,865	1,902	1,940	1,978	2,014	2,055	2,098	2,139	2,178
8	Total Costs	69,164	73,652	76,052	80,887	85,724	92,341	97,677	106,358	108,945	113,630	118,306	123,222	128,810	133,090	137,838
8.1	Percentage of GNP	1.62	1.66	1.64	1.70	1.83	1.9[illegible]	2.00	2.14	2.15	2.20	2.24	2.29	2.36	2.39	2.43

Footnotes to Table 8-6A

Total annualized costs for implementing existing and new regulations for all media for the years 1986-2000. Table includes costs incurred to achieve full implementation of existing regulations and are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3D, 3-3E, 4-3C, 5-3D, 5-3E, 6-3C, and 7-3C).

Table 8-6B: TOTAL COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	28,139	29,918	30,651	31,444	31,315	32,880	33,598	38,409	38,735	40,251	41,906	43,339	44,965	46,043	47,516
3.2	Radiation	366	340	368	414	463	509	555	603	653	703	755	807	861	913	967
3.3	Total Air & Radiation	28,505	30,258	31,019	31,858	31,778	33,389	34,153	39,013	39,387	40,954	42,660	44,146	45,726	46,956	48,483
4	Water															
4.1	Water Quality	37,535	39,905	41,019	42,912	45,218	47,535	49,606	51,781	53,958	56,169	58,370	60,560	62,740	64,910	67,069
4.2	Drinking Water	3,305	3,465	3,632	3,825	4,025	4,401	4,825	5,130	5,502	5,982	6,367	6,676	7,017	7,259	7,351
4.3	Total Water	40,840	43,370	44,651	46,737	49,243	51,936	54,431	56,911	59,460	62,151	64,737	67,236	69,758	72,168	74,420
5	Land															
5.1	Solid Waste	16,294	17,330	16,991	17,500	18,011	18,966	19,703	20,322	20,926	21,424	21,862	22,291	22,718	23,127	23,533
5.2	Hazardous Waste	1,436	1,762	3,155	3,727	4,604	6,083	7,564	8,315	9,160	9,848	10,131	10,977	11,721	12,473	13,194
5.3	LUST		1	13	1,444	3,482	4,140	4,734	5,301	3,988	3,634	3,692	3,751	5,008	4,713	4,733
5.4	RCRA	17,730	19,093	20,159	22,671	26,097	29,189	32,001	33,939	34,075	34,906	35,685	37,019	39,448	40,313	41,461
5.5	Superfund	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
5.6	Total Land	18,200	19,881	21,242	24,244	28,098	31,700	35,330	38,030	38,927	40,556	42,101	44,263	47,550	49,303	51,373
6	Chemicals															
6.1	Toxic Substances	419	385	480	605	669	891	1,074	1,209	1,224	1,241	1,298	1,318	1,333	1,345	1,364
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	838	839	934	1,301	1,648	1,976	2,244	2,466	2,528	2,594	2,705	2,783	2,849	2,927	3,022
7	Multi-Media	934	860	1,241	1,553	1,709	2,101	2,095	2,133	2,170	2,208	2,243	2,282	2,324	2,363	2,399
8	Total Costs	89,318	95,206	99,086	105,693	112,476	121,102	128,253	138,553	142,473	148,462	154,446	160,710	168,207	173,718	179,698
8.1	Percentage of GNP	2.09	2.15	2.14	2.22	2.40	2.53	2.63	2.78	2.81	2.87	2.93	2.99	3.08	3.12	3.17

Footnotes to Table 8-6B

Total annualized costs for implementing existing and new regulations for all media for the years 1986-2000. Table includes costs incurred to achieve full implementation of existing regulations and are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3G, 3-3H, 4-3E, 5-3G, 5-3H, 6-3E, and 7-3E).

Table 8-7: TOTAL FEDERALLY-MANDATED CAPITAL COSTS ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
3.2	Radiation			24	20	16	8	25	22	64	89	30	37	33	55	47
3.3	Total Air & Radiation	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,372
4	Water															
4.1	Water Quality	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,090	15,020	13,211	12,666	12,345	12,043	12,023	12,666
4.2	Drinking Water								40	40	40	40	40	40	40	40
4.3	Total Water	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,130	15,060	13,251	12,706	12,385	12,083	12,063	12,706
5	Land															
5.1	Solid Waste	67	77	137	128	119	106	117	115	119	123	103	129	207	209	205
5.2	Hazardous Waste												65	113	368	558
5.3	LUST															
5.4	RCRA	67	77	137	128	119	106	117	115	119	123	103	193	320	577	763
5.5	Superfund										42	193	293	648	748	713
5.6	Total Land	67	77	137	128	119	106	117	115	119	165	296	486	968	1,325	1,476
6	Chemicals															
6.1	Toxic Substances						2	48	83	27	17	59	31	136	153	162
6.2	Pesticides															
6.3	Total Chemicals						2	48	83	27	17	59	31	136	153	162
7	Multi-Media				4	19	45	13	42	68	120	76	79	109	84	46
8	Total Costs	18,211	20,225	20,704	23,956	24,249	25,798	25,078	26,138	25,887	24,239	23,297	22,755	24,349	24,920	25,762

Footnotes to Table 8-7

Total federally-mandated capital costs for implementing existing and new regulations for all media for the years 1972-1986. Table includes costs incurred to achieve full implementation of existing regulations and are taken from the corresponding program totals of the corresponding capital cost tables (those ending in "-1") each section, starting with Table 3-1 and ending with Table 7-1.

Table 8-7A: TOTAL FEDERALLY-MANDATED CAPITAL COSTS ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981
3.2	Radiation	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
3.3	Total Air & Radiation	11,372	11,624	11,680	11,258	10,861	10,957	10,987	10,964	11,028	11,068	11,058	11,103	11,101	11,103	11,105
4	Water															
4.1	Water Quality	12,666	13,132	11,543	11,264	12,926	12,539	12,563	12,374	12,301	12,228	12,155	12,082	12,009	11,937	11,864
4.2	Drinking Water	40	40	76	73	80	379	865	1,175	1,381	1,690	1,787	1,358	639	225	225
4.3	Total Water	12,706	13,172	11,619	11,336	13,006	12,918	13,428	13,549	13,682	13,918	13,942	13,440	12,648	12,162	12,089
5	Land															
5.1	Solid Waste	205	250	261	282	303	2,429	2,952	1,745	1,766	1,787	1,307	1,328	1,349	1,370	1,391
5.2	Hazardous Waste	558	502	1,772	2,449	2,929	2,345	4,002	3,952	4,529	4,081	4,222	4,731	4,092	4,154	4,215
5.3	LUST				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
5.4	RCRA	763	752	2,033	7,981	8,483	10,871	12,204	10,948	6,751	6,325	5,984	6,514	17,196	5,623	5,706
5.5	Superfund	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
5.6	Total Land	1,476	2,214	3,931	10,762	11,338	14,439	17,099	16,448	12,620	12,512	12,250	13,016	23,942	12,601	12,929
6	Chemicals															
6.1	Toxic Substances	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
6.2	Pesticides															
6.3	Total Chemicals	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
7	Multi-Media	46	43	1,899	395	1,534	5									
8	Total Costs	25,762	27,210	29,286	34,725	37,717	39,303	42,504	41,126	37,412	37,584	37,343	37,658	47,795	35,977	36,238

Footnotes to Table 8-7A

Total federally-mandated capital costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding capital tables (those ending in "-1A" and "-1B") in each section, starting with Table 3-1A and ending with Table 7-1A.

Table 8-17B: TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
3.1.2	New Regs															
3.1.3	Full Implementation															
3.1.4	Total Air	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
3.2	Radiation															
3.2.1	Existing Regs	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
3.2.2	New Regs															0
3.2.3	Total Radiation	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
3.3	Air & Radiation															
3.3.1	Existing Regs	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755
3.3.2	New Regs															0
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	8,734	9,847	11,299	12,443	14,161	15,515	16,589	17,835	19,007	20,181	20,993	22,408	23,458	24,778	26,414
4.1.2	New Regs															
4.1.3	Full Implementation															
4.1.4	Total Water Quality	8,734	9,847	11,299	12,443	14,161	15,515	16,589	17,835	19,007	20,181	20,993	22,408	23,458	24,778	26,414
4.2	Drinking Water															
4.2.1	Existing Regs	782	842	933	1,046	1,181	1,315	1,465	1,638	1,768	1,955	2,087	2,175	2,265	2,415	2,595
4.2.2	New Regs															
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	782	842	933	1,046	1,181	1,315	1,465	1,638	1,768	1,955	2,087	2,175	2,265	2,415	2,595
4.3	Water															
4.3.1	Existing Regs	9,516	10,689	12,233	13,489	15,342	16,830	18,054	19,473	20,775	22,136	23,079	24,582	25,723	27,193	29,009
4.3.2	New Regs															
4.3.3	Full Implementation															
4.3.4	Total Water	9,516	10,689	12,233	13,489	15,342	16,830	18,054	19,473	20,775	22,136	23,079	24,582	25,723	27,193	29,009
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,480	12,498	12,292	13,298	13,941	14,994
5.1.2	New Regs															
5.1.3	Total Solid Waste	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,480	12,498	12,292	13,298	13,941	14,994
5.2	Hazardous Waste															
5.2.1	Existing Regs										182	147	681	840	994	1,191
5.2.2	New Regs															190
5.2.3	Total Hazardous Waste										182	147	681	840	994	1,380

(continued on next page)

Table 8-17A (cont'd): TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REG ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
5.3.2	New Regs				1,281	3,184	3,675	4,125	4,549	3,214	2,838	2,875	2,913	3,861	3,553	3,561
5.3.3	Total LUST		1	13	1,311	3,215	3,716	4,177	4,611	3,286	2,920	2,966	3,014	3,972	3,673	3,691
5.4	RCRA															
5.4.1	Existing Regs	16,909	18,103	17,895	18,747	19,524	20,401	21,516	22,377	23,268	24,050	24,852	25,678	26,508	27,328	28,152
5.4.2	New Regs	199	306	1,493	2,917	5,318	7,228	8,623	9,431	8,519	8,418	8,254	8,611	9,786	9,705	9,904
5.4.3	Total RCRA	17,107	18,409	19,388	21,664	24,842	27,629	30,139	31,808	31,787	32,468	33,106	34,289	36,293	37,033	38,055
5.5	Superfund															
5.5.1	Existing Regs	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
5.5.2	New Regs															
5.5.3	Total Superfund	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
5.6	Land															
5.6.1	Existing Regs	17,312	18,786	18,825	20,096	21,228	22,525	24,332	25,815	27,317	28,740	30,148	31,636	33,152	34,683	36,245
5.6.2	New Regs	199	306	1,493	2,917	5,318	7,228	8,623	9,431	8,519	8,418	8,254	8,611	9,786	9,705	9,904
5.6.3	Total Land	17,511	19,092	20,318	23,013	26,547	29,753	32,956	35,247	35,836	37,158	38,402	40,247	42,938	44,388	46,148
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	396	365	376	396	375	432	452	473	483	497	512	526	537	546	560
6.1.2	New Regs	6		80	162	225	367	508	618	620	621	662	665	668	671	674
6.1.3	Total Toxic Subs	402	365	456	558	600	799	960	1,091	1,104	1,119	1,174	1,192	1,206	1,217	1,234
6.2	Pesticides															
6.2.1	Existing Regs	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.2.3	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Chemicals															
6.3.1	Existing Regs	816	819	830	1,093	1,354	1,518	1,622	1,730	1,788	1,850	1,918	1,991	2,053	2,127	2,217
6.3.2	New Regs	6		80	162	225	367	508	618	620	621	662	665	668	671	674
6.3.3	Total Chemicals	822	819	910	1,255	1,579	1,885	2,130	2,348	2,408	2,472	2,580	2,657	2,721	2,799	2,892
7	Multi-Media	918	842	1,180	1,483	1,603	1,995	1,989	2,027	2,065	2,102	2,138	2,177	2,220	2,260	2,298
8	Annualized Costs															
8.1	Total Existing Regs	79,841	84,938	86,670	90,470	93,339	97,957	101,852	105,295	108,490	111,463	114,411	117,548	120,687	123,823	126,932
8.2	Total New Regs	205	352	1,820	3,810	6,511	9,264	11,271	12,516	12,020	13,594	14,958	16,400	18,820	19,573	20,972
8.3	Total Full Impl					317	646	1,058	5,923	6,529	7,370	8,438	9,500	10,555	11,608	12,512
8.4	Total Annualized Costs	80,046	85,290	88,490	94,280	100,167	107,867	114,181	123,735	127,039	132,426	137,806	143,447	150,062	155,004	160,416

Footnotes to Table 8-17A

Sum of the annualized costs in Tables 3-3A, 3-3B, 4-3A, 5-3A, 5-3B, 6-3A, and 7-3A.

Table 8-17A: TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	25,077	26,634	27,117	27,540	27,216	28,351	28,882	29,241	29,430	29,513	29,581	29,744	29,890	30,026	30,125
3.1.2	New Regs		45	121	332	372	654	810	919	1,077	2,391	3,619	4,521	5,534	6,211	7,370
3.1.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.1.4	Total Air	25,077	26,679	27,238	27,872	27,588	29,005	29,692	34,528	34,905	36,493	38,212	39,699	41,278	42,513	44,049
3.2	Radiation															
3.2.1	Existing Regs	354	326	347	377	410	438	467	497	528	559	590	622	654	685	717
3.2.2	New Regs	0	1	6	19	31	45	58	71	85	100	115	130	146	162	179
3.2.3	Total Radiation	355	327	353	396	441	483	525	568	613	659	705	752	800	847	896
3.3	Air & Radiation															
3.3.1	Existing Regs	25,431	26,960	27,464	27,917	27,625	28,789	29,349	29,738	29,957	30,072	30,172	30,366	30,544	30,712	30,841
3.3.2	New Regs	0	46	127	350	403	699	868	990	1,163	2,491	3,733	4,651	5,680	6,373	7,549
3.3.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.3.4	Total Air & Radiation	25,431	27,006	27,591	28,267	28,029	29,488	30,217	35,096	35,518	37,151	38,917	40,451	42,078	43,361	44,944
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	32,386	34,421	35,213	36,654	38,137	39,576	40,895	42,225	43,513	44,763	46,009	47,251	48,489	49,723	50,954
4.1.2	New Regs			27	193	368	598	617	650	650	650	650	650	650	650	650
4.1.3	Full Implementation					317	646	1,058	1,555	2,131	2,781	3,426	4,066	4,701	5,332	5,958
4.1.4	Total Water Quality	32,386	34,421	35,241	36,847	38,823	40,820	42,571	44,430	46,295	48,194	50,085	51,967	53,840	55,706	57,563
4.2	Drinking Water															
4.2.1	Existing Regs	2,979	3,111	3,158	3,227	3,390	3,554	3,665	3,760	3,849	3,936	4,026	4,127	4,228	4,317	4,376
4.2.2	New Regs			92	188	196	372	654	826	1,068	1,414	1,658	1,822	2,036	2,174	2,195
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	2,979	3,111	3,250	3,415	3,587	3,926	4,319	4,586	4,917	5,350	5,684	5,949	6,264	6,491	6,571
4.3	Water															
4.3.1	Existing Regs	35,365	37,531	38,371	39,881	41,528	43,130	44,560	45,985	47,362	48,698	50,035	51,377	52,717	54,041	55,330
4.3.2	New Regs			120	381	565	970	1,272	1,476	1,718	2,064	2,308	2,473	2,686	2,824	2,845
4.3.3	Full Implementation					317	646	1,058	1,555	2,131	2,781	3,426	4,066	4,701	5,332	5,958
4.3.4	Total Water	35,365	37,531	38,491	40,262	42,410	44,746	46,890	49,017	51,212	53,543	55,769	57,916	60,104	62,197	64,134
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	15,697	16,683	16,298	16,761	17,226	17,690	18,029	18,352	18,663	18,987	19,310	19,625	19,940	20,240	20,537
5.1.2	New Regs						395	718	970	1,221	1,351	1,434	1,517	1,600	1,682	1,765
5.1.3	Total Solid Waste	15,697	16,683	16,298	16,761	17,226	18,085	18,747	19,322	19,884	20,338	20,744	21,142	21,539	21,922	22,302
5.2	Hazardous Waste															
5.2.1	Existing Regs	1,212	1,419	1,583	1,957	2,268	2,670	3,435	3,963	4,533	4,982	5,451	5,952	6,457	6,968	7,485
5.2.2	New Regs	199	306	1,493	1,636	2,134	3,158	3,781	3,913	4,084	4,228	3,945	4,181	4,325	4,469	4,577
5.2.3	Total Hazardous Waste	1,410	1,725	3,077	3,593	4,402	5,827	7,216	7,875	8,616	9,210	9,396	10,133	10,782	11,438	12,062

(continued on next page)

Table 8-17 (cont'd): TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REG ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,116	13,145	13,518	14,737	15,596	16,909
5.4.2	New Regs															199
5.4.3	Total RCRA	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,116	13,145	13,518	14,737	15,596	17,107
5.5	Superfund															
5.5.1	Existing Regs										15	59	112	235	312	404
5.5.2	New Regs															
5.5.3	Total Superfund										15	59	112	235	312	404
5.6	Land															
5.6.1	Existing Regs	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,131	13,204	13,630	14,972	15,908	17,312
5.6.2	New Regs															199
5.6.3	Total Land	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	14,131	13,204	13,630	14,972	15,908	17,511
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs			9	5	9	47	158	345	429	367	315	237	245	303	396
6.1.2	New Regs															6
6.1.3	Total Toxic Subs			9	5	9	47	158	345	429	367	315	237	245	303	402
6.2	Pesticides															
6.2.1	Existing Regs	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.2.3	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Chemicals															
6.3.1	Existing Regs	92	143	183	181	349	408	583	853	889	791	712	610	685	773	816
6.3.2	New Regs															6
6.3.3	Total Chemicals	92	143	183	181	349	408	583	853	889	791	712	610	685	773	822
7	Multi-Media	108	139	461	587	729	919	903	886	868	695	606	692	657	687	918
8	Annualized Costs															
8.3	Total Full Impl															
8.4	Total Annualized Costs	26,481	30,261	33,614	36,842	41,572	46,509	50,482	54,824	57,969	60,539	61,237	65,477	69,925	74,021	80 046

Footnotes to Table 8-17

Sum of the annualized costs in Tables 3-3, 4-3, 5-3, 6-3, and 7-3.

Table 8-17: TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
3.1.2	New Regs															
3.1.3	Full Implementation															
3.1.4	Total Air	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
3.2	Radiation															
3.2.1	Existing Regs	18	17	255	232	158	173	237	232	219	201	220	207	215	233	354
3.2.2	New Regs															0
3.2.3	Total Radiation	18	17	255	232	158	173	237	232	219	201	220	207	215	233	355
3.3	Air & Radiation															
3.3.1	Existing Regs	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431
3.3.2	New Regs															0
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,147	22,763	24,328	25,514	27,294	28,700	30,376	32,386
4.1.2	New Regs															
4.1.3	Full Implementation															
4.1.4	Total Water Quality	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,147	22,763	24,328	25,514	27,294	28,700	30,376	32,386
4.2	Drinking Water															
4.2.1	Existing Regs	802	883	998	1,135	1,294	1,451	1,623	1,823	1,982	2,198	2,357	2,471	2,586	2,765	2,979
4.2.2	New Regs															
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	802	883	998	1,135	1,294	1,451	1,623	1,823	1,982	2,198	2,357	2,471	2,586	2,765	2,979
4.3	Water															
4.3.1	Existing Regs	9,912	11,484	13,439	15,126	17,419	19,391	21,078	22,970	24,745	26,525	27,871	29,765	31,286	33,141	35,365
4.3.2	New Regs															
4.3.3	Full Implementation															
4.3.4	Total Water	9,912	11,484	13,439	15,126	17,419	19,391	21,078	22,970	24,745	26,525	27,871	29,765	31,286	33,141	35,365
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	13,934	12,998	12,835	13,892	14,587	15,697
5.1.2	New Regs															
5.1.3	Total Solid Waste	8,436	8,898	9,348	9,790	10,389	11,330	11,920	12,981	13,612	13,934	12,998	12,835	13,892	14,587	15,697
5.2	Hazardous Waste															
5.2.1	Existing Regs										182	147	683	845	1,009	1,212
5.2.2	New Regs															199
5.2.3	Total Hazardous Waste										182	147	683	845	1,009	1,410

(continued on next page)

Table 8-16A (cont'd): TOTAL OPERATING COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
5.3.2	New Regs				858	2,338	2,338	2,364	2,365	994	581	581	582	583	267	267
5.3.3	Total LUST		1	13	888	2,368	2,379	2,416	2,427	1,066	662	672	683	694	387	397
5.4	RCRA															
5.4.1	Existing Regs	14,394	15,348	14,911	15,455	15,895	16,396	17,104	17,554	18,018	18,386	18,783	19,205	19,628	20,051	20,474
5.4.2	New Regs	167	262	1,323	2,213	4,061	5,244	5,934	6,177	5,059	4,770	4,444	4,596	4,721	4,529	4,616
5.4.3	Total RCRA	14,561	15,610	16,234	17,668	19,956	21,640	23,038	23,731	23,077	23,156	23,227	23,801	24,349	24,580	25,090
5.5	Superfund															
5.5.1	Existing Regs	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
5.5.2	New Regs															
5.5.3	Total Superfund	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
5.6	Land															
5.6.1	Existing Regs	14,585	15,701	15,358	16,096	16,662	17,295	18,301	18,930	19,532	20,042	20,540	21,100	21,666	22,237	22,816
5.6.2	New Regs	167	262	1,323	2,213	4,061	5,244	5,934	6,177	5,059	4,770	4,444	4,596	4,721	4,529	4,616
5.6.3	Total Land	14,752	15,963	16,681	18,309	20,723	22,539	24,235	25,107	24,591	24,812	24,984	25,696	26,387	26,766	27,432
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	329	283	278	285	250	293	297	303	306	311	317	322	328	334	339
6.1.2	New Regs	6		80	84	68	132	195	305	307	308	349	352	355	358	361
6.1.3	Total Toxic Subs	335	283	358	369	318	425	492	608	613	619	666	674	683	692	700
6.2	Pesticides															
6.2.1	Existing Regs	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.2.3	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Chemicals															
6.3.1	Existing Regs	748	736	733	982	1,229	1,378	1,467	1,560	1,610	1,664	1,723	1,788	1,844	1,915	1,997
6.3.2	New Regs	6		80	84	68	132	195	305	307	308	349	352	355	358	361
6.3.3	Total Chemicals	754	736	813	1,066	1,297	1,510	1,662	1,865	1,917	1,972	2,072	2,140	2,199	2,273	2,358
7	Multi-Media	851	772	930	1,196	1,172	1,563	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883
8	Operating Costs															
8.1	Total Existing Regs	43,982	46,663	45,957	47,434	47,802	50,030	51,966	53,690	55,362	56,942	58,479	60,113	61,726	63,342	64,934
8.2	Total New Regs	173	262	1,514	2,795	4,799	6,670	7,763	8,303	7,436	8,626	9,622	10,692	11,976	12,569	13,806
8.3	Total Full Impl					176	358	586	5,229	5,578	6,129	6,909	7,685	8,457	9,229	9,853
8.4	Total Operating Costs	44,155	46,925	47,470	50,228	52,777	57,059	60,315	67,222	68,375	71,696	75,010	78,491	82,159	85,140	88,593

Footnotes to Table 8-16A

Sum of the operating costs in Tables 3-2A, 3-2B, 4-2A, 5-2A, 5-2B, 6-2A, and 7-2A.

Table 8-16A: TOTAL OPERATING COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	9,731	10,427	10,066	9,747	8,637	9,043	9,302	9,639	9,992	10,342	10,657	10,995	11,313	11,614	11,895
3.1.2	New Regs			17	169	186	437	561	648	780	2,066	3,266	4,139	5,136	5,796	6,937
3.1.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.1.4	Total Air	9,731	10,427	10,083	9,916	8,823	9,480	9,863	14,655	15,170	16,997	18,935	20,568	22,303	23,686	25,386
3.2	Radiation															
3.2.1	Existing Regs	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
3.2.2	New Regs	0	0	3	8	14	20	25	31	36	42	48	53	59	65	71
3.2.3	Total Radiation	314	281	300	330	362	389	417	445	473	502	530	558	587	615	644
3.3	Air & Radiation															
3.3.1	Existing Regs	10,045	10,708	10,363	10,068	8,985	9,413	9,694	10,053	10,429	10,802	11,139	11,499	11,840	12,164	12,468
3.3.2	New Regs	0	0	20	177	200	457	586	679	816	2,108	3,314	4,192	5,195	5,861	7,008
3.3.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.3.4	Total Air & Radiation	10,045	10,708	10,383	10,246	9,185	9,869	10,280	15,100	15,643	17,499	19,465	21,126	22,889	24,301	26,030
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	16,109	17,085	16,973	17,532	18,141	18,718	19,218	19,772	20,326	20,880	21,434	21,988	22,542	23,096	23,650
4.1.2	New Regs			2	142	291	519	529	562	562	562	562	562	562	562	562
4.1.3	Full Implementation					176	358	586	861	1,180	1,540	1,897	2,251	2,603	2,953	3,299
4.1.4	Total Water Quality	16,109	17,085	16,975	17,674	18,608	19,595	20,333	21,195	22,068	22,982	23,893	24,802	25,708	26,611	27,512
4.2	Drinking Water															
4.2.1	Existing Regs	1,645	1,661	1,600	1,560	1,613	1,664	1,729	1,780	1,832	1,883	1,935	1,986	2,038	2,090	2,119
4.2.2	New Regs			89	178	179	319	519	580	691	878	953	990	1,143	1,259	1,259
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	1,645	1,661	1,689	1,738	1,792	1,982	2,248	2,360	2,523	2,761	2,888	2,976	3,181	3,349	3,379
4.3	Water															
4.3.1	Existing Regs	17,753	18,746	18,573	19,092	19,754	20,381	20,947	21,552	22,158	22,764	23,369	23,975	24,580	25,186	25,770
4.3.2	New Regs			91	320	470	838	1,048	1,142	1,253	1,440	1,515	1,552	1,705	1,821	1,821
4.3.3	Full Implementation					176	358	586	861	1,180	1,540	1,897	2,251	2,603	2,953	3,299
4.3.4	Total Water	17,753	18,746	18,664	19,412	20,399	21,577	22,581	23,555	24,591	25,743	26,781	27,778	28,888	29,960	30,890
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	13,254	14,035	13,463	13,738	14,012	14,286	14,559	14,832	15,106	15,379	15,653	15,926	16,200	16,473	16,747
5.1.2	New Regs						196	273	395	516	516	516	516	516	516	516
5.1.3	Total Solid Waste	13,254	14,035	13,463	13,738	14,012	14,482	14,832	15,227	15,622	15,895	16,169	16,442	16,716	16,989	17,263
5.2	Hazardous Waste															
5.2.1	Existing Regs	1,139	1,312	1,435	1,688	1,853	2,070	2,493	2,660	2,841	2,926	3,039	3,178	3,318	3,457	3,597
5.2.2	New Regs	167	262	1,323	1,355	1,723	2,710	3,297	3,417	3,549	3,673	3,347	3,498	3,622	3,746	3,833
5.2.3	Total Hazardous Waste	1,306	1,574	2,758	3,043	3,576	4,780	5,790	6,077	6,390	6,599	6,386	6,676	6,940	7,203	7,430

(continued on next page)

Table 8-16 (cont'd): TOTAL OPERATING COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,538	11,407	11,624	12,658	13,301	14,394
5.4.2	New Regs															167
5.4.3	Total RCRA	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,538	11,407	11,624	12,658	13,301	14,561
5.5	Superfund															
5.5.1	Existing Regs										12	40	69	140	157	191
5.5.2	New Regs															
5.5.3	Total Superfund										12	40	69	140	157	191
5.6	Land															
5.6.1	Existing Regs	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,550	11,447	11,693	12,798	13,458	14,585
5.6.2	New Regs															167
5.6.3	Total Land	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,550	11,447	11,693	12,798	13,458	14,752
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs			9	5	9	47	154	332	414	350	293	212	207	251	329
6.1.2	New Regs															6
6.1.3	Total Toxic Subs			9	5	9	47	154	332	414	350	293	212	207	251	335
6.2	Pesticides															
6.2.1	Existing Regs	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.2.3	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Chemicals															
6.3.1	Existing Regs	92	143	183	181	349	408	578	840	874	774	690	585	647	721	748
6.3.2	New Regs															6
6.3.3	Total Chemicals	92	143	183	181	349	408	578	840	874	774	690	585	647	721	754
7	Multi-Media	108	139	461	587	726	913	896	875	850	665	570	648	603	625	851
8	Operating Costs															
8.3	Total Full Impl															
8.4	Total Operating Costs	24,735	26,545	27,876	28,678	30,936	33,258	34,666	36,303	36,767	36,768	35,046	36,939	38,800	40,538	44,155

Footnotes to Table 8-16

Sum of the operating costs in Tables 3-2, 4-2, 5-2, 6-2, and 7-2.

Table 8-16: TOTAL OPERATING COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
3.1.2	New Regs															
3.1.3	Full Implementation															
3.1.4	Total Air	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
3.2	Radiation															
3.2.1	Existing Regs	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
3.2.2	New Regs															0
3.2.3	Total Radiation	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
3.3	Air & Radiation															
3.3.1	Existing Regs	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045
3.3.2	New Regs															0
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,121	12,526	13,026	13,191	13,976	14,413	15,119	16,109
4.1.2	New Regs															
4.1.3	Full Implementation															
4.1.4	Total Water Quality	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,121	12,526	13,026	13,191	13,976	14,413	15,119	16,109
4.2	Drinking Water															
4.2.1	Existing Regs	732	741	774	824	899	979	1,073	1,180	1,238	1,353	1,417	1,442	1,471	1,549	1,645
4.2.2	New Regs															
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	732	741	774	824	899	979	1,073	1,180	1,238	1,353	1,417	1,442	1,471	1,549	1,645
4.3	Water															
4.3.1	Existing Regs	8,817	9,288	10,102	10,596	11,672	12,309	12,717	13,301	13,764	14,379	14,608	15,419	15,884	16,668	17,753
4.3.2	New Regs															
4.3.3	Full Implementation															
4.3.4	Total Water	8,817	9,288	10,102	10,596	11,672	12,309	12,717	13,301	13,764	14,379	14,608	15,419	15,884	16,668	17,753
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,356	11,260	10,947	11,830	12,344	13,254
5.1.2	New Regs															
5.1.3	Total Solid Waste	8,309	8,626	8,919	9,215	9,665	10,448	10,878	11,763	12,213	12,356	11,260	10,947	11,830	12,344	13,254
5.2	Hazardous Waste															
5.2.1	Existing Regs										182	147	677	828	958	1,139
5.2.2	New Regs															167
5.2.3	Total Hazardous Waste										182	147	677	828	958	1,306

(continued on next page)

Table 8-15A (cont'd): TOTAL CAPITAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
5.3.3	Total LUST				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
5.4	RCRA															
5.4.1	Existing Regs	2,335	2,541	2,417	3,277	3,563	3,981	5,662	5,883	6,188	5,945	5,871	5,941	6,011	6,080	6,150
5.4.2	New Regs	337	130	1,338	6,420	6,629	8,593	8,239	6,754	2,246	2,056	1,783	2,237	12,842	1,193	1,199
5.4.3	Total RCRA	2,672	2,671	3,755	9,697	10,192	12,574	13,901	12,637	8,434	8,001	7,654	8,178	18,853	7,273	7,349
5.5	Superfund															
5.5.1	Existing Regs	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
5.5.2	New Regs															
5.5.3	Total Superfund	713	1,462	1,898	2,781	2,855	3,568	4,895	5,500	5,869	6,187	6,266	6,502	6,746	6,978	7,223
5.6	Land															
5.6.1	Existing Regs	3,048	4,003	4,315	6,058	6,418	7,549	10,557	11,383	12,057	12,132	12,137	12,443	12,757	13,058	13,373
5.6.2	New Regs	337	130	1,338	6,420	6,629	8,593	8,239	6,754	2,246	2,056	1,783	2,237	12,842	1,193	1,199
5.6.3	Total Land	3,385	4,133	5,653	12,478	13,047	16,142	18,796	18,137	14,303	14,188	13,920	14,680	25,599	14,251	14,572
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	162	156	158	143	148	154	160	165	82	87	93	99	104	110	116
6.1.2	New Regs				830	830	830	830								
6.1.3	Total Toxic Subs	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
6.2	Pesticides															
6.2.1	Existing Regs															
6.2.3	Total Pesticides															
6.3	Chemicals															
6.3.1	Existing Regs	162	156	158	143	148	154	160	165	82	87	93	99	104	110	116
6.3.2	New Regs				830	830	830	830								
6.3.3	Total Chemicals	162	156	158	973	978	984	990	165	82	87	93	99	104	110	116
7	Multi-Media	46	43	1,899	395	1,534	5									
8	Capital Costs															
8.1	Total Existing Regs	28,546	29,702	29,857	29,380	30,767	30,305	32,830	33,220	33,357	33,013	32,984	33,310	33,597	33,876	34,157
8.2	Total New Regs	338	611	2,294	8,290	8,154	10,167	10,396	8,178	3,911	4,040	3,874	3,910	13,807	1,756	1,774
8.3	Total Full Impl					1,757	1,822	2,281	2,751	3,189	3,597	3,571	3,545	3,519	3,493	3,467
8.4	Total Capital Costs	28,884	30,313	32,151	37,670	40,678	42,295	45,507	44,150	40,457	40,650	40,429	40,765	50,923	39,126	39,398

Footnotes to Table 8-15A

Sum of the capital costs shown in Tables 3-1A, 3-1B, 4-1A, 5-1A, 5-1B, 6-1A, and 7-1A.

Table 8-15A: TOTAL CAPITAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	11,325	11,091	11,051	10,618	10,587	10,628	10,648	10,720	10,750	10,779	10,758	10,791	10,778	10,769	10,758
3.1.2	New Regs		477	573	574	203	253	257	156	186	191	197	203	210	216	223
3.1.3	Full Implementation															
3.1.4	Total Air	11,325	11,568	11,624	11,192	10,790	10,880	10,905	10,876	10,936	10,970	10,955	10,995	10,988	10,985	10,981
3.2	Radiation															
3.2.1	Existing Regs	47	56	56	66	72	77	82	87	92	98	103	108	113	118	124
3.2.2	New Regs	1	4	34	79	79	94	89	93	98	103	107	112	117	122	127
3.2.3	Total Radiation	48	60	90	145	151	171	171	180	190	201	210	220	230	240	251
3.3	Air & Radiation															
3.3.1	Existing Regs	11,372	11,147	11,107	10,684	10,658	10,704	10,730	10,808	10,843	10,876	10,861	10,899	10,891	10,887	10,882
3.3.2	New Regs	1	481	607	653	282	347	346	249	284	294	304	315	327	338	350
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	11,373	11,628	11,714	11,337	10,940	11,051	11,076	11,057	11,126	11,171	11,165	11,215	11,218	11,225	11,232
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	12,666	13,132	11,229	10,950	10,836	10,697	10,166	9,623	9,112	8,631	8,584	8,537	8,491	8,444	8,397
4.1.2	New Regs			314	314	333	19	116								
4.1.3	Full Implementation					1,757	1,822	2,281	2,751	3,189	3,597	3,571	3,545	3,519	3,493	3,467
4.1.4	Total Water Quality	12,666	13,132	11,543	11,264	12,926	12,539	12,563	12,374	12,301	12,228	12,155	12,082	12,009	11,937	11,864
4.2	Drinking Water															
4.2.1	Existing Regs	1,251	1,220	1,149	1,150	1,173	1,196	1,218	1,241	1,264	1,286	1,309	1,332	1,354	1,377	1,390
4.2.2	New Regs			36	73	80	379	865	1,175	1,381	1,690	1,787	1,358	639	225	225
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	1,251	1,220	1,185	1,223	1,253	1,575	2,083	2,416	2,645	2,976	3,096	2,690	1,993	1,602	1,615
4.3	Water															
4.3.1	Existing Regs	13,917	14,352	12,378	12,100	12,009	11,893	11,385	10,864	10,375	9,917	9,893	9,869	9,845	9,821	9,787
4.3.2	New Regs			350	387	413	398	981	1,175	1,381	1,690	1,787	1,358	639	225	225
4.3.3	Full Implementation					1,757	1,822	2,281	2,751	3,189	3,597	3,571	3,545	3,519	3,493	3,467
4.3.4	Total Water	13,917	14,352	12,728	12,487	14,179	14,113	14,646	14,790	14,946	15,204	15,251	14,772	14,002	13,539	13,479
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	2,115	2,169	1,983	1,998	2,012	2,027	2,041	2,056	2,070	2,085	2,099	2,114	2,128	2,143	2,157
5.1.2	New Regs						2,105	2,607	1,379	1,379	1,379	877	877	877	877	877
5.1.3	Total Solid Waste	2,115	2,169	1,983	1,998	2,012	4,132	4,648	3,435	3,449	3,464	2,976	2,991	3,005	3,020	3,034
5.2	Hazardous Waste															
5.2.1	Existing Regs	221	372	434	1,279	1,550	1,954	3,620	3,827	4,118	3,860	3,772	3,827	3,882	3,938	3,993
5.2.2	New Regs	337	130	1,338	1,170	1,379	391	382	125	411	221	450	904	210	216	222
5.2.3	Total Hazardous Waste	558	502	1,772	2,449	2,929	2,345	4,002	3,952	4,529	4,081	4,222	4,731	4,092	4,154	4,215

(continued on next page)

Table 8-15 (cont'd): TOTAL CAPITAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,656	1,961	2,280	2,335
5.4.2	New Regs															337
5.4.3	Total RCRA	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,656	1,961	2,280	2,672
5.5	Superfund															
5.5.1	Existing Regs										42	193	293	648	748	713
5.5.2	New Regs															
5.5.3	Total Superfund										42	193	293	648	748	713
5.6	Land															
5.6.1	Existing Regs	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,942	1,893	1,949	2,609	3,028	3,048
5.6.2	New Regs															337
5.6.3	Total Land	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,942	1,893	1,949	2,609	3,028	3,385
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs						2	48	83	27	17	59	31	136	153	162
6.1.2	New Regs															
6.1.3	Total Toxic Subs						2	48	83	27	17	59	31	136	153	162
6.2	Pesticides															
6.2.1	Existing Regs															
6.2.3	Total Pesticides															
6.3	Chemicals															
6.3.1	Existing Regs						2	48	83	27	17	59	31	136	153	162
6.3.2	New Regs															
6.3.3	Total Chemicals						2	48	83	27	17	59	31	136	153	162
7	Multi-Media				4	19	45	13	42	68	120	76	79	109	84	46
8	Capital Costs															
8.3	Total Full Impl															
8.4	Total Capital Costs	20,225	22,451	23,105	26,297	26,600	28,178	27,484	28,825	28,715	27,036	25,870	25,113	26,864	27,656	28,884

Footnotes to Table 8-15

Sum of the capital costs shown in Tables 3-1, 4-1, 5-1, 6-1, and 7-1.

Table 8-15: TOTAL CAPITAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
3.1.2	New Regs															
3.1.3	Full Implementation															
3.1.4	Total Air	5,422	7,388	7,392	10,074	10,037	10,032	9,980	10,745	10,549	10,598	10,130	9,737	11,020	11,240	11,325
3.2	Radiation															
3.2.1	Existing Regs			24	20	16	8	25	22	64	89	30	37	33	55	47
3.2.2	New Regs															1
3.2.3	Total Radiation			24	20	16	8	25	22	64	89	30	37	33	55	48
3.3	Air & Radiation															
3.3.1	Existing Regs	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,372
3.3.2	New Regs															1
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	5,422	7,388	7,416	10,094	10,053	10,040	10,005	10,767	10,613	10,687	10,160	9,774	11,053	11,295	11,373
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,090	15,020	13,211	12,666	12,345	12,043	12,023	12,666
4.1.2	New Regs															
4.1.3	Full Implementation															
4.1.4	Total Water Quality	12,721	12,761	13,151	13,730	14,058	15,605	14,895	15,090	15,020	13,211	12,666	12,345	12,043	12,023	12,666
4.2	Drinking Water															
4.2.1	Existing Regs	736	772	868	917	895	814	825	979	1,081	1,060	1,016	935	915	1,073	1,251
4.2.2	New Regs															
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	736	772	868	917	895	814	825	979	1,081	1,060	1,016	935	915	1,073	1,251
4.3	Water															
4.3.1	Existing Regs	13,457	13,533	14,019	14,647	14,953	16,420	15,720	16,070	16,101	14,270	13,682	13,280	12,958	13,096	13,917
4.3.2	New Regs															
4.3.3	Full Implementation															
4.3.4	Total Water	13,457	13,533	14,019	14,647	14,953	16,420	15,720	16,070	16,101	14,270	13,682	13,280	12,958	13,096	13,917
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,591	1,848	1,912	2,115
5.1.2	New Regs															
5.1.3	Total Solid Waste	1,345	1,530	1,670	1,552	1,575	1,671	1,699	1,863	1,906	1,900	1,700	1,591	1,848	1,912	2,115
5.2	Hazardous Waste															
5.2.1	Existing Regs												65	113	368	221
5.2.2	New Regs															337
5.2.3	Total Hazardous Waste												65	113	368	558

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4. Private annualized costs for implementing existing regulations for water quality. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1959-2000, annualized at 10 percent assuming a capital life of 30 years, and added to the operating cost estimates taken from the corresponding water operating cost tables (i.e., 4-2, 4-2A). The capital stock shown for 1959 in Table 8-13 is assumed to have been invested in 1959, even though much of it presumably dates from earlier years.

5. Private annualized costs for implementing existing regulations for water quality. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1972-2000, annualized at 10 percent assuming a capital life of 30 years, and added to the operating cost estimates taken from the corresponding water operating cost tables (i.e., 4-2, 4-2A).

6. Line 4 minus line 5.

Table 8-14D: PRIVATE COSTS OF AIR AND WATER POLLUTION CONTROL ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Prv Air (incl 1960-71)	8,735	9,604	9,909	10,951	12,394	13,797	15,059	15,453	15,832	16,330	16,519	17,760	18,576	19,156	20,138
2 Pr Air (not inc 60-71)	5,987	6,856	7,161	8,204	9,646	11,049	12,311	13,231	13,665	14,219	14,468	15,779	16,683	17,376	18,514
3 Difference	2,748	2,748	2,748	2,748	2,748	2,748	2,748	2,223	2,167	2,111	2,051	1,982	1,893	1,780	1,624
4 Prv Wtr (incl 1960-71)	6,511	7,672	8,383	9,286	10,565	11,795	12,857	13,977	14,605	15,291	15,667	16,831	17,758	18,725	19,729
5 Pr Wtr (not inc 60-71)	4,121	5,283	5,993	6,896	8,175	9,406	10,468	11,587	12,215	12,901	13,278	14,441	15,368	16,335	17,339
6 Difference	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390	2,390

Table 8-14E: PRIVATE COSTS OF AIR AND WATER POLLUTION CONTROL ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Prv Air (incl 1960-71)	20,138	21,022	20,943	21,107	21,658	21,842	21,920	21,795	21,662	21,474	21,343	21,241	21,145	20,994	20,831
2 Pr Air (not inc 60-71)	18,514	19,616	19,781	20,236	21,166	21,842	21,920	21,795	21,662	21,474	21,343	21,241	21,145	20,994	20,831
3 Difference	1,624	1,406	1,162	871	492										
4 Prv Wtr (incl 1960-71)	19,729	21,093	21,320	21,615	22,339	23,049	23,741	24,411	25,049	25,650	26,204	26,670	27,101	27,487	27,774
5 Pr Wtr (not inc 60-71)	17,339	18,704	18,930	19,722	20,499	21,260	22,006	22,736	23,451	24,150	24,833	25,502	26,154	26,791	27,413
6 Difference	2,390	2,390	2,390	1,893	1,840	1,789	1,735	1,675	1,598	1,501	1,370	1,168	947	696	361

Footnotes to Tables 8-14D and 8-14E by lines:

1. Private annualized costs for implementing existing regulations for stationary air. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1959-2000, annualized at 10 percent assuming a capital life of 20 years, and added to the operating cost estimates taken from the corresponding air operating cost tables (i.e., 3-2, 3-2A). The capital stock shown for 1959 in Table 8-13 is assumed to have been invested in 1959, even though much of it presumably dates from earlier years.

2. Private annualized costs for implementing existing regulations for stationary air. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1972-2000, annualized at 10 percent assuming a capital life of 20 years, and added to the operating cost estimates taken from the corresponding air operating cost tables (i.e., 3-2, 3-2A).

3. Line 1 minus line 2.

4. Private annualized costs for implementing existing regulations for water quality. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1959-2000, annualized at 3 percent assuming a capital life of 30 years, and added to the operating cost estimates taken from the corresponding water operating cost tables (i.e., 4-2, 4-2A). The capital stock shown for 1959 in Table 8-13 is assumed to have been invested in 1959, even though much of it presumably dates from earlier years.

5. Private annualized costs for implementing existing regulations for water quality. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1972-2000, annualized at 3 percent assuming a capital life of 30 years, and added to the operating cost estimates taken from the corresponding water operating cost tables (i.e., 4-2, 4-2A).

6. Line 4 minus line 5.

Table 8-14B: PRIVATE COSTS OF AIR AND WATER POLLUTION CONTROL ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Prv Air (incl 1960-71)	7,308	7,845	7,818	8,509	9,631	10,730	11,694	11,999	12,085	12,312	12,250	13,299	13,930	14,347	15,190
2 Pr Air (not inc 60-71)	5,736	6,272	6,246	6,937	8,059	9,157	10,122	10,727	10,845	11,104	11,077	12,165	12,847	13,329	14,261
3 Difference	1,572	1,572	1,572	1,572	1,572	1,572	1,572	1,272	1,240	1,208	1,174	1,134	1,083	1,018	929
4 Prv Wtr (incl 1960-71)	4,876	5,606	5,940	6,458	7,316	8,116	8,743	9,446	9,708	10,078	10,151	11,012	11,614	12,259	12,941
5 Pr Wtr (not inc 60-71)	3,727	4,457	4,791	5,309	6,167	6,967	7,594	8,296	8,559	8,929	9,002	9,863	10,464	11,109	11,792
6 Difference	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149	1,149

Table 8-14C: PRIVATE COSTS OF AIR AND WATER POLLUTION CONTROL ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Prv Air (incl 1960-71)	15,190	15,960	15,786	15,880	16,403	16,612	16,761	16,794	16,821	16,817	16,847	16,892	16,941	16,959	16,969
2 Pr Air (not inc 60-71)	14,261	15,156	15,121	15,382	16,122	16,612	16,761	16,794	16,821	16,817	16,847	16,892	16,941	16,959	16,969
3 Difference	929	804	665	498	281										
4 Prv Wtr (incl 1960-71)	12,941	13,980	13,908	14,170	14,639	15,101	15,555	15,997	16,424	16,834	17,221	17,566	17,894	18,200	18,458
5 Pr Wtr (not inc 60-71)	11,792	12,831	12,759	13,260	13,754	14,241	14,720	15,192	15,656	16,113	16,562	17,004	17,438	17,865	18,285
6 Difference	1,149	1,149	1,149	910	885	860	835	806	769	722	659	562	455	335	173

Footnotes to Tables 8-14B and 8-14C by lines:

1. Private annualized costs for implementing existing regulations for stationary air. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1959-2000, annualized at 3 percent assuming a capital life of 20 years, and added to the operating cost estimates taken from the corresponding air operating cost tables (i.e., 3-2, 3-2A). The capital stock shown for 1959 in Table 8-13 is assumed to have been invested in 1959, even though much of it presumably dates from earlier years.

2. Private annualized costs for implementing existing regulations for stationary air. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1972-2000, annualized at 3 percent assuming a capital life of 20 years, and added to the operating cost estimates taken from the corresponding air operating cost tables (i.e., 3-2, 3-2A).

3. Line 1 minus line 2.

4. Private annualized costs for implementing existing regulations for water quality. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1959-2000, annualized at 7 percent assuming a capital life of 30 years, and added to the operating cost estimates taken from the corresponding water operating cost tables (i.e., 4-2, 4-2A). The capital stock shown for 1959 in Table 8-13 is assumed to have been invested in 1959, even though much of it presumably dates from earlier years.

5. Private annualized costs for implementing existing regulations for water quality. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1972-2000, annualized at 7 percent assuming a capital life of 30 years, and added to the operating cost estimates taken from the corresponding water operating cost tables (i.e., 4-2, 4-2A).

6. Line 4 minus line 5.

Table 8-14: PRIVATE COSTS OF AIR AND WATER POLLUTION CONTROL ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Prv Air (incl 1960-71)	8,080	8,796	8,949	9,830	11,126	12,389	13,514	13,867	14,111	14,485	14,559	15,712	16,443	16,948	17,867
2 Pr Air (not inc 60-71)	5,872	6,588	6,741	7,622	8,918	10,181	11,306	12,081	12,370	12,789	12,911	14,120	14,922	15,518	16,561
3 Difference	2,208	2,208	2,208	2,208	2,208	2,208	2,208	1,786	1,741	1,696	1,648	1,593	1,521	1,430	1,305
4 Prv Wtr (incl 1960-71)	5,754	6,716	7,252	7,977	9,060	10,092	10,952	11,879	12,338	12,878	13,113	14,137	14,913	15,731	16,586
5 Pr Wtr (not inc 60-71)	3,939	4,900	5,437	6,161	7,245	8,277	9,137	10,064	10,522	11,062	11,298	12,321	13,098	13,916	14,771
6 Difference	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815	1,815

Table 8-14A: PRIVATE COSTS OF AIR AND WATER POLLUTION CONTROL ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Prv Air (incl 1960-71)	17,867	18,698	18,575	18,707	19,245	19,441	19,552	19,499	19,440	19,336	19,279	19,244	19,215	19,141	19,058
2 Pr Air (not inc 60-71)	16,561	17,568	17,642	18,007	18,850	19,441	19,552	19,499	19,440	19,336	19,279	19,244	19,215	19,141	19,058
3 Difference	1,305	1,130	934	700	395										
4 Prv Wtr (incl 1960-71)	16,586	17,800	17,888	18,168	18,774	19,369	19,951	20,516	21,056	21,569	22,045	22,455	22,838	23,187	23,460
5 Pr Wtr (not inc 60-71)	14,771	15,985	16,073	16,730	17,376	18,010	18,632	19,243	19,842	20,429	21,004	21,567	22,119	22,658	23,187
6 Difference	1,815	1,815	1,815	1,438	1,398	1,359	1,318	1,273	1,214	1,140	1,041	888	719	529	274

Footnotes to Tables 8-14 and 8-14A by lines:

1. Private annualized costs for implementing existing regulations for stationary air. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1959-2000, annualized at 7 percent assuming a capital life of 20 years, and added to the operating cost estimates taken from the corresponding air operating cost tables (i.e., 3-2, 3-2A). The capital stock shown for 1959 in Table 8-13 is assumed to have been invested in 1959, even though much of it presumably dates from earlier years.

2. Private annualized costs for implementing existing regulations for stationary air. Capital cost estimates are taken from Tables 8-13, 8-13A, and 8-13B for the years 1972-2000, annualized at 7 percent assuming a capital life of 20 years, and added to the operating cost estimates taken from the corresponding air operating cost tables (i.e., 3-2, 3-2A).

3. Line 1 minus line 2.

Table 8-13: PRIVATE CAPITAL COSTS OF AIR AND WATER POLLUTION CONTROL

(millions of 1986 dollars)

Media	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
1 Private Air	4,471	477	473	510	590	758	962	1,325	1,861	2,074	2,479	3,229	4,185
2 Private Water	4,686	496	484	504	567	727	917	1,231	1,902	2,089	2,363	3,162	3,399
3 Total Priv Air & Water	9,158	973	957	1,014	1,157	1,485	1,878	2,556	3,763	4,163	4,843	6,391	7,584

Table 8-13A: PRIVATE CAPITAL COSTS OF AIR AND WATER POLLUTION CONTROL

(millions of 1986 dollars)

Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Private Air	4,994	6,626	6,601	6,983	6,387	6,061	5,908	6,276	6,288	5,860	5,508	4,425	4,433	4,207	4,090
2 Private Water	7,166	7,838	6,828	6,996	7,648	7,813	7,904	7,578	6,640	5,737	5,510	5,495	5,904	5,854	5,835
3 Total Priv Air & Water	12,160	14,466	13,429	13,979	14,035	13,874	13,813	13,854	12,928	11,597	11,019	9,919	10,338	10,061	9,925

Table 8-13B: PRIVATE CAPITAL COSTS OF AIR AND WATER POLLUTION CONTROL

(millions of 1986 dollars)

Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Private Air	4,090	4,122	3,971	3,876	3,781	3,686	3,591	3,496	3,401	3,306	3,212	3,117	3,022	2,927	2,832
2 Private Water	5,835	5,917	5,425	5,279	5,132	4,986	4,840	4,694	4,548	4,402	4,256	4,110	3,964	3,818	3,672
3 Total Priv Air & Water	9,925	10,039	9,395	9,154	8,913	8,672	8,431	8,190	7,949	7,708	7,467	7,227	6,986	6,745	6,504

Footnotes to Tables 8-13, 8-13A, 8-13B

1959-1988: Private capital investment in stationary air and water pollution control. Source: Department of Commerce, Bureau of Economic Analysis (BEA).

1989-2000: Linear extrapolation of 1975-1988 data for air and 1976-1988 data for water.

Footnotes to Table 8-12E

Total annualized costs for implementing existing and new regulations for all media by funding source for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3G, 3-3H, 4-3E, 5-3G, 5-3H, 6-3E, and 7-3E).

Table 8-12E: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE ANNUALIZED AT 10%

(millions of 1986 dollars)

Funding Source/Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A EPA															
A.3 Air	244	268	235	245	260	328	251	249	247	245	243	241	239	238	236
A.4 Water	6,485	6,799	7,051	7,261	7,520	7,735	7,836	7,924	7,963	7,957	7,950	7,943	7,936	7,930	7,923
A.5 Land	476	739	925	1,106	1,241	1,421	1,626	1,843	2,071	2,312	2,564	2,830	3,108	3,397	3,699
A.6 Chemicals	163	175	181	239	212	206	215	225	236	246	257	268	278	289	301
A.7 Multi-Media	393	389	424	434	481	528	499	514	529	544	559	580	601	622	643
A.8 Total EPA	7,762	8,370	8,816	9,285	9,714	10,217	10,426	10,755	11,046	11,304	11,573	11,862	12,163	12,476	12,801
A.9 Percentage of Total	8.69	8.79	8.90	8.78	8.66	8.49	8.21	8.12	8.14	8.03	7.95	7.87	7.75	7.73	7.70
B Non-EPA Federal															
B.3 Air	650	680	727	774	822	870	919	968	1,005	1,040	1,075	1,113	1,156	1,197	1,240
B.4 Water	1,064	1,134	1,231	1,336	1,448	1,569	1,697	1,832	1,976	2,127	2,286	2,453	2,627	2,810	3,000
B.5 Land	390	492	570	1,009	1,354	1,820	2,947	3,752	4,562	5,247	5,886	6,583	7,283	7,985	8,691
B.6 Chemicals	195	142	144	148	152	158	163	169	176	184	193	201	208	209	216
B.7 Multi-Media	541	470	497	522	547	570	593	616	638	661	681	699	720	738	752
B.8 Total Non-EPA Federal	2,841	2,919	3,169	3,789	4,323	4,986	6,318	7,337	8,357	9,259	10,121	11,050	11,993	12,938	13,899
B.9 Percentage of Total	3.18	3.07	3.20	3.58	3.86	4.14	4.97	5.54	6.16	6.58	6.95	7.34	7.64	8.02	8.36
C State Government															
C.3 Air	1,101	1,133	1,142	1,178	1,211	1,241	1,249	1,250	1,246	1,241	1,225	1,199	1,172	1,132	1,077
C.4 Water	2,088	2,117	2,137	2,212	2,289	2,367	2,446	2,526	2,608	2,692	2,777	2,862	2,947	3,028	3,109
C.5 Land	45	63	92	127	164	207	253	305	357	418	484	554	630	709	794
C.6 Chemicals	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
C.8 Total State Govt	3,250	3,329	3,388	3,541	3,683	3,836	3,969	4,106	4,234	4,375	4,509	4,641	4,777	4,895	5,006
C.9 Percentage of Total	3.64	3.50	3.42	3.35	3.29	3.19	3.12	3.10	3.12	3.11	3.10	3.08	3.04	3.03	3.01
D Local Government															
D.3 Air															
D.4 Water	13,292	14,013	14,638	15,339	16,055	16,917	17,816	18,641	19,489	20,427	21,289	22,089	22,921	23,676	24,312
D.5 Land	6,305	6,580	6,532	6,881	7,229	7,952	8,413	8,845	9,122	9,359	9,626	9,894	10,221	10,471	10,738
D.6 Chemicals	6		80	177	259	420	581	645	645	645	645	645	645	645	645
D.7 Multi-Media			18	42	42	42	42	42	42	42	42	42	42	42	42
D.8 Total Local Govt	19,603	20,593	21,268	22,440	23,584	25,331	26,851	28,173	29,297	30,472	31,601	32,670	33,829	34,833	35,736
D.9 Percentage of Total	21.95	21.63	21.46	21.23	21.04	21.05	21.14	21.28	21.60	21.66	21.72	21.69	21.55	21.59	21.48
E Private															
E.3 Air	26,510	28,176	28,915	29,661	29,486	30,950	31,735	32,179	32,492	33,839	35,105	36,158	37,305	38,114	39,377
E.4 Water	17,911	19,307	19,593	20,588	21,569	22,611	23,429	24,212	24,992	25,776	26,527	27,249	27,961	28,640	29,277
E.5 Land	10,984	12,006	13,122	15,121	18,110	20,301	22,091	23,285	22,815	23,219	23,541	24,401	26,309	26,741	27,452
E.6 Chemicals	457	506	512	713	1,005	1,171	1,265	1,401	1,449	1,495	1,586	1,645	1,688	1,758	1,833
E.7 Multi-Media			303	555	640	962	962	962	962	962	962	962	962	962	962
E.8 Total Private	55,863	59,995	62,445	66,639	70,809	75,995	79,481	82,039	82,709	85,291	87,721	90,414	94,225	96,216	98,902
E.9 Percentage of Total	62.54	63.02	63.02	63.05	63.16	63.14	62.56	61.96	60.98	60.62	60.28	60.02	60.02	59.63	59.46
F Total Costs	89,318	95,206	99,086	105,693	112,114	120,364	127,045	132,410	135,643	140,700	145,525	150,636	156,988	161,357	166,345

Footnotes to Table 8-12D

Total annualized costs for implementing existing and new regulations for all media by funding source for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3F, 4-3D, 5-3F, 6-3D, and 7-3D).

Table 8-12D: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE ANNUALIZED AT 10%

(millions of 1986 dollars)

	Funding Source/Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A	EPA															
A.3	Air	359	381	306	304	291	295	239	322	341	292	274	246	249	249	244
A.4	Water	442	617	1,225	1,418	2,051	2,720	3,243	3,786	4,475	4,938	5,342	5,638	5,866	6,173	6,485
A.5	Land	70	72	20	24	36	36	39	99	114	217	205	247	335	383	476
A.6	Chemicals	26	33	43	40	75	79	69	144	148	182	147	136	131	145	163
A.7	Multi-Media	108	139	193	203	263	443	488	402	434	412	365	343	358	371	393
A.8	Total EPA	1,004	1,242	1,788	1,990	2,717	3,573	4,079	4,752	5,512	6,042	6,333	6,609	6,940	7,324	7,762
A.9	Percentage of Total	3.72	3.97	5.08	5.09	6.11	7.14	7.46	7.96	8.67	9.05	9.30	9.06	8.90	8.86	8.69
B	Non-EPA Federal															
B.3	Air			422	409	411	466	557	463	476	436	453	473	514	605	650
B.4	Water	89	102	371	475	549	576	639	667	716	712	786	842	856	953	1,064
B.5	Land			87	122	123	122	119	130	133	186	215	223	270	374	390
B.6	Chemicals					13	53	68	190	288	188	152	81	90	130	195
B.7	Multi-Media			268	384	466	478	418	487	438	290	250	360	313	331	541
B.8	Total Non-EPA Federal	89	102	1,148	1,390	1,562	1,695	1,800	1,937	2,051	1,811	1,856	1,979	2,042	2,394	2,841
B.9	Percentage of Total	0.33	0.33	3.26	3.56	3.51	3.39	3.29	3.24	3.23	2.71	2.73	2.71	2.62	2.90	3.18
C	State Government															
C.3	Air	362	401	460	436	458	519	582	660	735	759	813	879	938	1,012	1,101
C.4	Water	1,191	1,171	1,189	1,312	1,377	1,404	1,425	1,491	1,623	1,717	1,706	1,705	1,808	1,929	2,088
C.5	Land										0	6	13	25	34	45
C.6	Chemicals	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
C.8	Total State Govt	1,554	1,572	1,650	1,749	1,835	1,926	2,019	2,176	2,381	2,496	2,543	2,614	2,788	2,993	3,250
C.9	Percentage of Total	5.76	5.02	4.68	4.47	4.13	3.85	3.69	3.64	3.75	3.74	3.74	3.59	3.58	3.62	3.64
D	Local Government															
D.3	Air															
D.4	Water	4,261	4,829	5,510	6,217	6,806	7,216	7,603	8,110	8,766	9,629	10,444	11,135	11,686	12,341	13,292
D.5	Land	3,545	3,657	3,811	3,989	4,033	4,233	4,508	4,659	4,807	4,931	5,071	5,232	5,561	5,937	6,305
D.6	Chemicals															
D.7	Multi-Media															6
D.8	Total Local Govt	7,806	8,486	9,321	10,206	10,839	11,449	12,111	12,769	13,573	14,560	15,515	16,367	17,247	18,278	19,603
D.9	Percentage of Total	28.94	27.11	26.46	26.12	24.38	22.87	22.14	21.38	21.35	21.80	22.79	22.45	22.12	22.11	21.95
E	Private															
E.3	Air	7,337	9,109	9,456	10,696	12,437	14,314	15,974	17,281	18,129	18,971	19,585	21,664	23,333	24,543	26,510
E.4	Water	4,269	5,449	6,184	7,116	8,426	9,681	10,773	11,929	12,587	13,311	13,721	14,909	15,862	16,865	17,911
E.5	Land	4,852	5,235	5,536	5,796	6,374	7,155	7,509	8,391	8,899	9,184	8,138	8,391	9,319	9,789	10,984
E.6	Chemicals	65	110	139	140	261	273	434	497	434	406	400	382	457	492	457
E.7	Multi-Media															
E.8	Total Private	16,524	19,903	21,315	23,747	27,498	31,424	34,690	38,098	40,049	41,872	41,844	45,346	48,971	51,689	55,863
E.9	Percentage of Total	61.25	63.58	60.52	60.76	61.86	62.76	63.42	63.78	63.00	62.70	61.45	62.19	62.79	62.52	62.54
F	Total Costs	26,978	31,305	35,222	39,082	44,451	50,067	54,699	59,732	63,566	66,781	68,091	72,916	77,988	82,679	89,318

Footnotes to Table 8-12C

Total annualized costs for implementing existing and new regulations for all media by funding source for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3D, 3-3E, 4-3C, 5-3D, 5-3E, 6-3C, and 7-3C).

Table 8-12C: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE ANNUALIZED AT 3%

(millions of 1986 dollars)

	Funding Source/Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A	EPA															
A.3	Air	244	268	235	245	260	328	251	249	247	245	243	241	239	238	236
A.4	Water	3,281	3,439	3,566	3,664	3,815	3,925	3,950	3,989	4,004	3,997	3,991	3,984	3,977	3,970	3,964
A.5	Land	395	616	743	868	953	1,070	1,205	1,346	1,491	1,643	1,800	1,964	2,134	2,309	2,490
A.6	Chemicals	163	175	181	239	212	206	215	225	236	246	257	268	278	289	301
A.7	Multi-Media	393	389	424	434	481	528	499	514	529	544	559	580	601	622	643
A.8	Total EPA	4,476	4,887	5,149	5,450	5,721	6,057	6,119	6,322	6,507	6,676	6,850	7,037	7,230	7,428	7,634
A.9	Percentage of Total	6.47	6.64	6.77	6.74	6.69	6.60	6.32	6.28	6.33	6.26	6.20	6.15	6.07	6.07	6.04
B	Non-EPA Federal															
B.3	Air	578	603	644	686	728	770	813	855	891	926	960	997	1,035	1,073	1,113
B.4	Water	740	773	828	887	950	1,017	1,087	1,161	1,239	1,321	1,406	1,495	1,588	1,685	1,785
B.5	Land	325	401	450	791	1,018	1,329	2,159	2,638	3,105	3,458	3,778	4,155	4,534	4,914	5,296
B.6	Chemicals	181	126	126	127	128	131	132	135	138	141	145	149	151	151	154
B.7	Multi-Media	505	433	458	482	506	529	551	574	597	619	641	661	682	702	720
B.8	Total Non-EPA Federal	2,330	2,335	2,506	2,974	3,330	3,775	4,743	5,364	5,970	6,465	6,930	7,457	7,991	8,525	9,068
B.9	Percentage of Total	3.37	3.17	3.29	3.68	3.90	4.11	4.90	5.33	5.81	6.06	6.28	6.52	6.71	6.97	7.18
C	State Government															
C.3	Air	847	865	862	886	909	930	939	943	945	947	941	931	919	900	873
C.4	Water	1,738	1,740	1,730	1,775	1,820	1,867	1,913	1,961	2,009	2,058	2,107	2,157	2,206	2,254	2,301
C.5	Land	35	50	72	100	132	168	206	249	293	344	399	458	521	588	659
C.6	Chemicals	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
C.8	Total State Govt	2,637	2,670	2,680	2,786	2,881	2,986	3,079	3,179	3,269	3,371	3,472	3,571	3,676	3,768	3,860
C.9	Percentage of Total	3.81	3.63	3.52	3.44	3.37	3.25	3.18	3.16	3.18	3.16	3.14	3.12	3.09	3.08	3.06
D	Local Government															
D.3	Air															
D.4	Water	11,012	11,505	11,959	12,485	13,022	13,693	14,403	15,033	15,679	16,403	17,045	17,638	18,289	18,883	19,361
D.5	Land	5,763	5,987	5,892	6,168	6,441	6,979	7,288	7,629	7,838	8,008	8,207	8,406	8,633	8,815	9,014
D.6	Chemicals	6		80	136	176	295	414	478	478	478	478	478	478	478	478
D.7	Multi-Media			10	34	34	34	34	34	34	34	34	34	34	34	34
D.8	Total Local Govt	16,781	17,492	17,941	18,822	19,672	21,001	22,139	23,174	24,030	24,924	25,764	26,555	27,434	28,210	28,886
D.9	Percentage of Total	24.26	23.75	23.59	23.27	23.02	22.88	22.87	23.02	23.38	23.36	23.33	23.22	23.05	23.06	22.87
E	Private															
E.3	Air	20,086	21,380	21,748	22,155	21,646	22,792	23,502	23,989	24,399	25,885	27,269	28,411	29,649	30,552	31,913
E.4	Water	12,238	13,297	13,256	13,933	14,603	15,357	15,896	16,407	16,920	17,443	17,941	18,419	18,903	19,367	19,797
E.5	Land	10,181	11,112	12,076	13,642	16,185	17,928	19,319	20,129	19,496	19,732	19,894	20,569	21,728	22,021	22,586
E.6	Chemicals	435	478	479	675	962	1,124	1,213	1,345	1,393	1,439	1,530	1,589	1,633	1,703	1,778
E.7	Multi-Media			216	450	458	780	780	780	780	780	780	780	780	780	780
E.8	Total Private	42,940	46,267	47,776	50,855	53,854	57,982	60,711	62,650	62,988	65,280	67,415	69,769	72,694	74,423	76,854
E.9	Percentage of Total	62.09	62.82	62.82	62.87	63.02	63.16	62.72	62.22	61.29	61.17	61.05	60.99	61.07	60.83	60.85
F	Total Costs	69,164	73,652	76,052	80,887	85,459	91,801	96,792	100,690	102,764	106,716	110,430	114,388	119,025	122,355	126,302

Footnotes to Table 8-12B

Total annualized costs for implementing existing and new regulations for all media by funding source for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3C, 4-3B, 5-3C, 6-3B, and 7-3B).

Table 8-12B: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE ANNUALIZED AT 3%

(millions of 1986 dollars)

	Funding Source/Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A	EPA															
A.3	Air	359	381	306	304	291	295	239	322	341	292	274	246	249	249	244
A.4	Water	384	471	897	874	1,255	1,582	1,826	2,074	2,447	2,649	2,810	2,923	2,996	3,143	3,281
A.5	Land	70	72	20	24	36	36	39	99	114	215	194	225	292	318	395
A.6	Chemicals	26	33	43	40	75	79	69	144	148	182	147	136	131	145	163
A.7	Multi-Media	108	139	193	203	263	443	488	402	434	412	365	343	358	371	393
A.8	Total EPA	947	1,096	1,459	1,446	1,921	2,435	2,662	3,041	3,485	3,751	3,790	3,873	4,026	4,226	4,476
A.9	Percentage of Total	3.66	3.77	4.60	4.23	5.03	5.75	5.84	6.20	6.78	7.05	7.12	6.82	6.66	6.62	6.47
B	Non-EPA Federal															
B.3	Air			416	395	389	438	524	424	431	385	398	413	451	537	578
B.4	Water	85	94	339	412	460	463	500	502	532	513	573	607	596	658	740
B.5	Land			84	116	115	113	108	119	120	171	200	205	240	329	325
B.6	Chemicals					13	53	67	184	281	180	143	72	80	118	181
B.7	Multi-Media			268	384	465	475	413	481	429	274	231	336	284	298	505
B.8	Total Non-EPA Federal	85	94	1,106	1,307	1,442	1,541	1,612	1,710	1,793	1,524	1,545	1,633	1,650	1,940	2,330
B.9	Percentage of Total	0.33	0.32	3.49	3.82	3.78	3.64	3.54	3.49	3.49	2.86	2.90	2.88	2.73	3.04	3.37
C	State Government															
C.3	Air	354	383	432	398	407	452	500	559	609	608	634	678	716	774	847
C.4	Water	1,174	1,136	1,136	1,239	1,285	1,289	1,284	1,321	1,422	1,488	1,451	1,430	1,510	1,606	1,738
C.5	Land										0	5	10	20	27	35
C.6	Chemicals	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
C.8	Total State Govt	1,528	1,519	1,568	1,638	1,692	1,744	1,796	1,905	2,054	2,115	2,109	2,136	2,264	2,424	2,637
C.9	Percentage of Total	5.90	5.23	4.94	4.79	4.43	4.12	3.94	3.88	4.00	3.97	3.96	3.76	3.74	3.80	3.81
D	Local Government															
D.3	Air															
D.4	Water	4,005	4,379	4,901	5,465	5,963	6,300	6,598	7,000	7,515	8,227	8,888	9,389	9,768	10,262	11,012
D.5	Land	3,514	3,595	3,717	3,863	3,874	4,040	4,280	4,395	4,507	4,595	4,697	4,820	5,111	5,444	5,763
D.6	Chemicals															6
D.7	Multi-Media															
D.8	Total Local Govt	7,518	7,975	8,619	9,328	9,837	10,340	10,879	11,395	12,022	12,821	13,585	14,209	14,879	15,706	16,781
D.9	Percentage of Total	29.03	27.46	27.16	27.26	25.75	24.42	23.89	23.22	23.38	24.09	25.54	25.04	24.61	24.59	24.26
E	Private															
E.3	Air	7,074	8,487	8,481	9,243	10,516	11,927	13,122	13,932	14,295	14,651	14,816	16,480	17,669	18,490	20,086
E.4	Water	3,868	4,609	4,960	5,498	6,379	7,197	7,846	8,576	8,859	9,259	9,357	10,233	10,853	11,525	12,238
E.5	Land	4,815	5,153	5,404	5,621	6,155	6,887	7,192	8,018	8,468	8,695	7,602	7,808	8,675	9,072	10,181
E.6	Chemicals	65	110	139	140	261	273	433	496	433	405	397	378	446	476	435
E.7	Multi-Media															
E.8	Total Private	15,823	18,359	18,985	20,503	23,311	26,284	28,593	31,021	32,054	33,010	32,172	34,899	37,643	39,563	42,940
E.9	Percentage of Total	61.09	63.21	59.82	59.91	61.02	62.07	62.79	63.22	62.35	62.02	60.47	61.50	62.26	61.95	62.09
F	Total Costs	25,901	29,042	31,737	34,222	38,203	42,344	45,542	49,072	51,408	53,221	53,200	56,751	60,462	63,860	69,164

Footnotes to Table 8-12A

Total annualized costs for implementing existing and new regulations for all media by funding source for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding seven percent annualized cost tables in each media chapter (Tables 3-3A, 3-3B, 4-3A, 5-3A, 5-3B, 6-3A, and 7-3A).

Table 8-12A: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE ANNUALIZED AT 7%

(millions of 1986 dollars)

Funding Source/Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A EPA															
A.3 Air	244	268	235	245	260	328	251	249	247	245	243	241	239	238	236
A.4 Water	5,001	5,243	5,438	5,596	5,805	5,971	6,036	6,102	6,130	6,123	6,117	6,110	6,103	6,096	6,090
A.5 Land	439	682	841	996	1,108	1,258	1,431	1,613	1,802	2,002	2,211	2,429	2,657	2,893	3,139
A.6 Chemicals	163	175	181	239	212	206	215	225	236	246	257	268	278	289	301
A.7 Multi-Media	393	389	424	434	481	528	499	514	529	544	559	580	601	622	643
A.8 Total EPA	6,240	6,758	7,118	7,509	7,865	8,291	8,432	8,703	8,944	9,161	9,386	9,628	9,879	10,139	10,409
A.9 Percentage of Total	7.80	7.92	8.04	7.96	7.88	7.73	7.45	7.39	7.42	7.33	7.26	7.19	7.08	7.07	7.04
B Non-EPA Federal															
B.3 Air	617	645	689	733	778	824	870	916	953	987	1,022	1,060	1,100	1,140	1,182
B.4 Water	914	967	1,045	1,128	1,218	1,313	1,414	1,522	1,635	1,754	1,879	2,009	2,146	2,289	2,437
B.5 Land	360	450	515	908	1,199	1,593	2,584	3,239	3,890	4,423	4,914	5,464	6,016	6,570	7,126
B.6 Chemicals	189	135	136	139	141	146	149	154	159	164	171	177	182	182	188
B.7 Multi-Media	525	453	479	504	528	551	574	597	619	642	663	681	703	721	738
B.8 Total Non-EPA Federal	2,605	2,649	2,863	3,412	3,865	4,427	5,591	6,427	7,256	7,970	8,648	9,392	10,146	10,902	11,670
B.9 Percentage of Total	3.25	3.11	3.24	3.62	3.87	4.13	4.94	5.46	6.02	6.37	6.69	7.01	7.27	7.60	7.89
C State Government															
C.3 Air	984	1,010	1,013	1,044	1,073	1,099	1,107	1,109	1,108	1,106	1,095	1,076	1,056	1,026	983
C.4 Water	1,926	1,942	1,949	2,010	2,072	2,135	2,199	2,265	2,331	2,398	2,467	2,536	2,604	2,670	2,735
C.5 Land	40	57	83	115	149	189	231	279	327	384	444	510	579	653	732
C.6 Chemicals	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
C.8 Total State Govt	2,967	3,025	3,061	3,193	3,313	3,444	3,558	3,678	3,788	3,911	4,030	4,147	4,269	4,375	4,476
C.9 Percentage of Total	3.71	3.55	3.46	3.39	3.32	3.21	3.15	3.12	3.14	3.13	3.12	3.10	3.06	3.05	3.03
D Local Government															
D.3 Air															
D.4 Water	12,238	12,854	13,400	14,020	14,653	15,427	16,239	16,974	17,729	18,568	19,328	20,033	20,781	21,462	22,025
D.5 Land	6,056	6,308	6,238	6,554	6,867	7,505	7,896	8,286	8,532	8,738	8,974	9,210	9,492	9,710	9,945
D.6 Chemicals	6		80	158	221	363	504	568	568	568	568	568	568	568	568
D.7 Multi-Media			14	38	38	38	38	38	38	38	38	38	38	38	38
D.8 Total Local Govt	18,301	19,162	19,733	20,770	21,779	23,333	24,678	25,867	26,868	27,913	28,909	29,850	30,879	31,778	32,577
D.9 Percentage of Total	22.86	22.47	22.30	22.03	21.81	21.76	21.81	21.96	22.29	22.32	22.35	22.28	22.13	22.16	22.03
E Private															
E.3 Air	23,586	25,083	25,654	26,245	25,918	27,237	27,990	28,454	28,813	30,224	31,545	32,639	33,829	34,682	35,990
E.4 Water	15,285	16,525	16,659	17,508	18,344	19,253	19,942	20,599	21,256	21,919	22,553	23,162	23,768	24,348	24,889
E.5 Land	10,615	11,595	12,642	14,441	17,224	19,208	20,813	21,830	21,284	21,611	21,859	22,633	24,195	24,563	25,206
E.6 Chemicals	447	493	497	695	985	1,149	1,241	1,376	1,423	1,470	1,560	1,619	1,663	1,733	1,808
E.7 Multi-Media			263	507	556	878	878	878	878	878	878	878	878	878	878
E.8 Total Private	49,933	53,696	55,715	59,396	63,027	67,726	70,864	73,137	73,654	76,101	78,395	80,932	84,333	86,203	88,772
E.9 Percentage of Total	62.38	62.96	62.96	63.00	63.12	63.16	62.64	62.08	61.12	60.85	60.60	60.42	60.45	60.12	60.02
F Total Costs	80,046	85,290	88,490	94,280	99,850	107,221	113,123	117,811	120,510	125,056	129,368	133,948	139,507	143,396	147,904

Footnotes to Table 8-12

Total annualized costs for implementing existing and new regulations for all media by funding source for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding seven percent annualized cost tables (those ending "-3") in each media chapter, starting with Table 3-3 and ending with Table 7-3.

Table 8-12: TOTAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE ANNUALIZED AT 7%

(millions of 1986 dollars)

	Funding Source/Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A	EPA															
A.3	Air	359	381	306	304	291	295	239	322	341	292	274	246	249	249	244
A.4	Water	415	550	1,073	1,166	1,683	2,193	2,587	2,993	3,536	3,878	4,170	4,381	4,537	4,771	5,001
A.5	Land	70	72	20	24	36	36	39	99	114	216	200	237	315	353	439
A.6	Chemicals	26	33	43	40	75	79	69	144	148	182	147	136	131	145	163
A.7	Multi-Media	108	139	193	203	263	443	488	402	434	412	365	343	358	371	393
A.8	Total EPA	978	1,174	1,636	1,738	2,348	3,046	3,423	3,960	4,574	4,981	5,155	5,342	5,591	5,890	6,240
A.9	Percentage of Total	3.69	3.88	4.87	4.72	5.65	6.55	6.78	7.22	7.89	8.23	8.42	8.16	8.00	7.96	7.80
B	Non-EPA Federal															
B.3	Air			419	402	401	453	542	445	455	413	428	445	485	573	617
B.4	Water	87	98	356	446	508	524	574	591	630	620	687	733	735	817	914
B.5	Land			85	119	119	118	114	125	127	179	208	215	256	353	360
B.6	Chemicals					13	53	67	187	285	184	148	77	85	124	189
B.7	Multi-Media			268	384	465	476	416	485	434	282	242	349	299	316	525
B.8	Total Non-EPA Federal	87	98	1,129	1,352	1,507	1,624	1,713	1,832	1,932	1,678	1,712	1,819	1,861	2,184	2,605
B.9	Percentage of Total	0.33	0.33	3.36	3.67	3.62	3.49	3.39	3.34	3.33	2.77	2.80	2.78	2.66	2.95	3.25
C	State Government															
C.3	Air	359	393	447	419	434	489	544	613	677	690	731	787	836	902	984
C.4	Water	1,183	1,154	1,164	1,278	1,334	1,351	1,360	1,412	1,530	1,611	1,588	1,578	1,670	1,780	1,926
C.5	Land										0	6	12	23	31	40
C.6	Chemicals	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
C.8	Total State Govt	1,542	1,548	1,612	1,698	1,769	1,842	1,916	2,051	2,230	2,320	2,343	2,394	2,546	2,731	2,967
C.9	Percentage of Total	5.82	5.11	4.80	4.61	4.26	3.96	3.80	3.74	3.85	3.83	3.83	3.66	3.64	3.69	3.71
D	Local Government															
D.3	Air															
D.4	Water	4,143	4,621	5,228	5,869	6,416	6,793	7,139	7,597	8,188	8,981	9,725	10,328	10,800	11,380	12,238
D.5	Land	3,530	3,629	3,768	3,931	3,960	4,144	4,404	4,538	4,669	4,777	4,899	5,043	5,355	5,711	6,056
D.6	Chemicals															6
D.7	Multi-Media															
D.8	Total Local Govt	7,673	8,250	8,996	9,801	10,376	10,937	11,542	12,135	12,857	13,758	14,624	15,371	16,155	17,091	18,301
D.9	Percentage of Total	28.98	27.26	26.76	26.60	24.96	23.52	22.86	22.13	22.18	22.73	23.88	23.48	23.10	23.09	22.86
E	Private															
E.3	Air	7,217	8,824	9,009	10,031	11,559	13,224	14,673	15,753	16,380	17,002	17,412	19,302	20,754	21,787	23,586
E.4	Water	4,084	5,060	5,617	6,367	7,478	8,531	9,418	10,377	10,861	11,435	11,701	12,744	13,543	14,393	15,285
E.5	Land	4,835	5,197	5,475	5,716	6,274	7,032	7,363	8,220	8,701	8,959	7,892	8,124	9,023	9,460	10,615
E.6	Chemicals	65	110	139	140	261	273	434	496	433	406	398	380	452	485	447
E.7	Multi-Media															
E.8	Total Private	16,201	19,191	20,241	22,254	25,572	29,060	31,887	34,846	36,376	37,802	37,403	40,550	43,772	46,125	49,933
E.9	Percentage of Total	61.18	63.42	60.22	60.40	61.51	62.48	63.17	63.56	62.75	62.44	61.08	61.93	62.60	62.31	62.38
F	Total Costs	26,481	30,261	33,614	36,842	41,572	46,509	50,482	54,824	57,969	60,539	61,237	65,477	69,925	74,021	80,046

Footnotes to Table 8-11A

Total operating costs for present implementation of existing regulatory programs for all media for the years 1986-2000. **Estimates are taken from the** corresponding program totals of the corresponding operating cost tables (those ending in "-2A" or "-2B") in **each media chapter, starting with Table 3-2A and** ending with Table 7-2A.

Table 8-11A: TOTAL OPERATING COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE

(millions of 1986 dollars)

	Funding Source/Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A	EPA															
A.3	Air	244	268	235	245	260	328	251	249	247	245	243	241	239	238	236
A.4	Water	312	326	337	331	381	396	349	342	335	329	322	315	308	302	295
A.5	Land	319	501	573	648	687	744	815	885	954	1,024	1,092	1,162	1,232	1,301	1,370
A.6	Chemicals	163	175	181	239	212	206	215	225	236	246	257	268	278	289	301
A.7	Multi-Media	393	389	424	434	481	528	499	514	529	544	559	580	601	622	643
A.8	Total EPA	1,431	1,659	1,750	1,897	2,021	2,202	2,128	2,215	2,301	2,387	2,473	2,566	2,659	2,751	2,845
A.9	Percentage of Total	3.24	3.54	3.69	3.78	3.84	3.88	3.56	3.57	3.66	3.64	3.63	3.62	3.61	3.62	3.61
B	Non-EPA Federal															
B.3	Air	487	506	541	577	612	647	682	718	753	788	823	859	894	929	964
B.4	Water	439	437	455	472	489	506	523	540	557	574	591	608	625	642	659
B.5	Land	248	295	312	542	632	765	1,252	1,357	1,431	1,405	1,363	1,375	1,387	1,400	1,412
B.6	Chemicals	163	105	102	99	96	95	91	89	86	84	81	79	76	73	71
B.7	Multi-Media	458	382	405	428	450	473	496	519	541	564	587	610	632	655	678
B.8	Total Non-EPA Federal	1,795	1,726	1,815	2,117	2,280	2,485	3,044	3,222	3,368	3,415	3,445	3,530	3,615	3,700	3,784
B.9	Percentage of Total	4.07	3.68	3.82	4.21	4.33	4.38	5.10	5.20	5.36	5.21	5.06	4.99	4.90	4.87	4.81
C	State Government															
C.3	Air	507	507	487	496	505	515	524	534	543	553	562	572	581	591	600
C.4	Water	1,404	1,381	1,343	1,359	1,374	1,389	1,405	1,420	1,435	1,451	1,466	1,482	1,497	1,512	1,528
C.5	Land	27	37	53	76	102	132	163	198	233	275	320	369	421	476	535
C.6	Chemicals	17	16	16	24	20	21	21	25	22	23	24	25	29	26	27
C.8	Total State Govt	1,955	1,941	1,899	1,954	2,001	2,057	2,113	2,177	2,234	2,302	2,373	2,447	2,528	2,605	2,689
C.9	Percentage of Total	4.43	4.14	4.00	3.89	3.80	3.63	3.54	3.51	3.56	3.51	3.48	3.46	3.43	3.43	3.42
D	Local Government															
D.3	Air															
D.4	Water	8,668	8,931	9,205	9,549	9,902	10,369	10,882	11,305	11,736	12,228	12,629	12,999	13,464	13,899	14,221
D.5	Land	5,038	5,194	5,036	5,224	5,407	5,710	5,827	6,056	6,176	6,257	6,364	6,472	6,579	6,670	6,778
D.6	Chemicals	6		80	80	64	128	191	255	255	255	255	255	255	255	255
D.7	Multi-Media				24	24	24	24	24	24	24	24	24	24	24	24
D.8	Total Local Govt	13,712	14,124	14,321	14,877	15,396	16,231	16,924	17,640	18,191	18,764	19,272	19,749	20,322	20,848	21,278
D.9	Percentage of Total	31.05	30.10	30.17	29.62	29.27	28.63	28.33	28.45	28.97	28.62	28.30	27.89	27.57	27.46	27.02
E	Private															
E.3	Air	8,807	9,427	9,120	8,929	7,808	8,379	8,823	9,232	9,702	11,324	12,824	14,020	15,321	16,268	17,676
E.4	Water	6,929	7,672	7,324	7,701	8,079	8,559	8,836	9,087	9,348	9,522	9,876	10,123	10,391	10,652	10,889
E.5	Land	9,119	9,936	10,707	11,820	13,895	15,188	16,178	16,610	15,797	15,852	15,845	16,319	16,768	16,919	17,336
E.6	Chemicals	405	440	434	624	905	1,061	1,144	1,270	1,318	1,364	1,455	1,514	1,560	1,629	1,705
E.7	Multi-Media			101	310	216	538	538	538	538	538	538	538	538	538	538
E.8	Total Private	25,260	27,475	27,685	29,384	30,903	33,726	35,519	36,738	36,704	38,700	40,538	42,514	44,578	46,007	48,143
E.9	Percentage of Total	57.21	58.55	58.32	58.50	58.75	59.48	59.47	59.26	58.45	59.02	59.53	60.04	60.48	60.61	61.14
F	Total Costs	44,155	46,925	47,470	50,228	52,601	56,701	59,729	61,992	62,797	65,567	68,101	70,805	73,701	75,911	78,740

Footnotes to Table 8-11

Total operating costs for present implementation of existing regulatory programs for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding operating cost tables (those ending in "-2") in each media chapter, starting with Table 3-2 and ending with Table 7-2.

Table 8-11: TOTAL OPERATING COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE

(millions of 1986 dollars)

	Funding Source/Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A	EPA															
A.3	Air	359	381	306	304	291	295	239	322	341	292	274	246	249	249	244
A.4	Water	331	336	593	371	518	528	514	489	569	528	464	408	336	333	312
A.5	Land	70	72	20	24	36	36	39	99	114	213	183	204	251	257	319
A.6	Chemicals	26	33	43	40	75	79	69	144	148	182	147	136	131	145	163
A.7	Multi-Media	108	139	193	203	263	443	488	402	434	412	365	343	358	371	393
A.8	Total EPA	894	960	1,155	943	1,183	1,381	1,349	1,455	1,607	1,628	1,433	1,337	1,326	1,355	1,431
A.9	Percentage of Total	3.61	3.62	4.14	3.29	3.82	4.15	3.89	4.01	4.37	4.43	4.09	3.62	3.42	3.34	3.24
B	Non-EPA Federal															
B.3	Air			407	376	361	402	481	375	374	320	329	338	371	451	487
B.4	Water	81	86	309	354	378	358	370	349	361	330	376	388	355	385	439
B.5	Land			80	109	105	101	94	103	103	152	179	181	203	273	248
B.6	Chemicals					13	53	65	176	272	169	132	60	67	103	163
B.7	Multi-Media			268	384	463	470	408	473	416	253	205	305	245	254	458
B.8	Total Non-EPA Federal	81	86	1,064	1,223	1,320	1,383	1,418	1,476	1,525	1,224	1,220	1,272	1,240	1,466	1,795
B.9	Percentage of Total	0.33	0.32	3.82	4.26	4.27	4.16	4.09	4.07	4.15	3.33	3.48	3.44	3.20	3.62	4.07
C	State Government															
C.3	Air	343	359	394	348	338	363	390	423	441	406	396	410	420	455	507
C.4	Water	1,157	1,103	1,086	1,172	1,199	1,182	1,153	1,161	1,233	1,271	1,210	1,169	1,226	1,298	1,404
C.5	Land											4	8	16	20	27
C.6	Chemicals	0	0	0	1	1	3	12	25	23	19	18	17	17	18	17
C.8	Total State Govt	1,501	1,463	1,480	1,520	1,538	1,548	1,555	1,610	1,697	1,695	1,628	1,604	1,679	1,791	1,955
C.9	Percentage of Total	6.07	5.51	5.31	5.30	4.97	4.65	4.49	4.43	4.61	4.61	4.64	4.34	4.33	4.42	4.43
D	Local Government															
D.3	Air															
D.4	Water	3,754	3,937	4,297	4,712	5,111	5,366	5,569	5,858	6,225	6,781	7,283	7,593	7,797	8,124	8,668
D.5	Land	3,473	3,512	3,592	3,694	3,661	3,783	3,976	4,042	4,106	4,144	4,196	4,270	4,510	4,786	5,038
D.6	Chemicals															6
D.7	Multi-Media															
D.8	Total Local Govt	7,227	7,450	7,889	8,406	8,772	9,149	9,545	9,901	10,331	10,925	11,480	11,863	12,307	12,910	13,712
D.9	Percentage of Total	29.22	28.07	28.30	29.31	28.36	27.51	27.53	27.27	28.10	29.71	32.76	32.11	31.72	31.85	31.05
E	Private															
E.3	Air	6,707	7,609	7,103	7,071	7,533	8,120	8,487	8,404	7,909	7,381	6,732	7,600	7,829	7,911	8,807
E.4	Water	3,493	3,825	3,817	3,987	4,467	4,876	5,112	5,444	5,376	5,470	5,276	5,861	6,169	6,529	6,929
E.5	Land	4,766	5,042	5,228	5,388	5,862	6,528	6,769	7,519	7,891	8,042	6,885	7,030	7,818	8,122	9,119
E.6	Chemicals	65	110	139	140	261	273	432	494	431	404	392	372	432	454	405
E.7	Multi-Media															
E.8	Total Private	15,032	16,585	16,288	16,586	18,123	19,797	20,799	21,861	21,607	21,296	19,285	20,863	22,248	23,016	25,260
E.9	Percentage of Total	60.77	62.48	58.43	57.84	58.58	59.53	60.00	60.22	58.77	57.92	55.03	56.48	57.34	56.78	57.21
F	Total Costs	24,735	26,545	27,876	28,678	30,936	33,258	34,666	36,303	36,767	36,768	35,046	36,939	38,800	40,538	44,155

Footnotes to Table 8-10A

Total capital costs for present implementation of existing regulatory programs for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding capital cost tables (those ending in "-1A" or "-1B") in each media chapter, starting with Table 3-1A and ending with Table 7-1A.

Table 8-10A: TOTAL CAPITAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE

(millions of 1986 dollars)

Funding Source/Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
A EPA															
A.3 Air															
A.4 Water	3,113	2,831	2,271	2,038	1,971	1,879	1,395	898	434						
A.5 Land	293	760	1,077	995	905	1,155	1,270	1,385	1,501	1,616	1,731	1,846	1,961	2,076	2,191
A.6 Chemicals															
A.7 Multi-Media															
A.8 Total EPA	3,406	3,591	3,348	3,033	2,876	3,034	2,665	2,283	1,935	1,616	1,731	1,846	1,961	2,076	2,191
A.9 Percentage of Total	11.79	11.85	10.41	8.05	7.39	7.50	6.16	5.51	5.19	4.36	4.70	4.96	4.14	5.83	6.10
B Non-EPA Federal															
B.3 Air	85	97	96	106	111	115	120	125	129	134	139	143	148	153	157
B.4 Water	533	680	753	826	899	972	1,046	1,119	1,192	1,265	1,338	1,412	1,485	1,558	1,631
B.5 Land	366	494	545	1,858	2,264	2,966	5,677	6,225	6,602	6,396	6,109	6,130	6,151	6,173	6,194
B.6 Chemicals	45	42	48	53	59	65	70	76	82	87	93	99	104	110	116
B.7 Multi-Media	46	43	34	24	15	5									
B.8 Total Non-EPA Federal	1,075	1,355	1,476	2,867	3,348	4,124	6,913	7,545	8,005	7,883	7,679	7,784	7,889	7,994	8,099
B.9 Percentage of Total	3.72	4.47	4.59	7.61	8.60	10.19	15.99	18.23	21.48	21.27	20.83	20.91	16.64	22.43	22.54
C State Government															
C.3 Air	312	276	253	227	200	174	148	121	95	69	42	16	(10)	(37)	(63)
C.4 Water	484	490	544	557	570	582	595	608	621	633	646	659	672	684	697
C.5 Land	33	84	120	111	101	128	141	154	167	180	192	205	218	231	243
C.6 Chemicals															
C.8 Total State Govt	829	850	917	894	871	884	884	883	883	882	880	880	879	879	877
C.9 Percentage of Total	2.87	2.80	2.85	2.37	2.24	2.18	2.04	2.13	2.37	2.38	2.39	2.36	1.85	2.47	2.44
D Local Government															
D.3 Air															
D.4 Water	3,729	4,215	3,214	3,259	3,317	3,593	4,120	4,290	4,490	4,775	4,887	4,568	4,013	3,708	3,732
D.5 Land	984	1,018	930	1,425	1,448	3,616	3,598	2,392	1,965	1,988	2,010	2,033	2,634	2,060	2,082
D.6 Chemicals				830	830	830	830								
D.7 Multi-Media			149												
D.8 Total Local Govt	4,714	5,233	4,293	5,515	5,594	8,040	8,548	6,682	6,455	6,762	6,897	6,601	6,647	5,768	5,814
D.9 Percentage of Total	16.32	17.26	13.35	14.64	14.37	19.86	19.77	16.14	17.32	18.25	18.71	17.74	14.02	16.19	16.18
E Private															
E.3 Air	10,976	11,256	11,365	11,005	10,629	10,762	10,808	10,811	10,902	10,968	10,984	11,056	11,080	11,109	11,138
E.4 Water	6,058	6,137	5,946	5,806	5,665	5,264	5,210	5,124	5,020	4,934	4,809	4,588	4,314	4,096	3,951
E.5 Land	1,709	1,777	2,981	8,089	8,329	8,277	8,110	7,981	4,068	4,008	3,878	4,466	14,634	3,712	3,862
E.6 Chemicals	117	114	110	89	89	89	89	89							
E.7 Multi-Media			1,716	371	1,519										
E.8 Total Private	18,860	19,284	22,118	25,361	26,232	24,391	24,217	24,005	19,990	19,910	19,671	20,109	30,028	18,917	18,951
E.9 Percentage of Total	65.30	63.62	68.79	67.32	67.40	60.27	56.02	57.99	53.64	53.73	53.37	54.03	63.34	53.09	52.74
F Total Costs	28,884	30,313	32,151	37,670	38,921	40,473	43,227	41,398	37,268	37,053	36,858	37,220	47,404	35,633	35,932

Footnotes to Table 8-10

Total capital costs for present implementation of existing regulatory programs for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding capital cost tables (those ending in "-1") in each media chapter, starting with Table 3-1 and ending with Table 7-1.

Table 8-10: TOTAL CAPITAL COSTS ASSUMING PRESENT IMPLEMENTATION BY FUNDING SOURCE

(millions of 1986 dollars)

Funding Source/Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A EPA															
A.3 Air															
A.4 Water	1,044	1,607	3,312	3,906	4,589	6,209	5,067	5,349	5,734	4,755	4,413	3,316	2,828	2,950	3,113
A.5 Land										38	171	195	389	396	293
A.6 Chemicals															
A.7 Multi-Media															
A.8 Total EPA	1,044	1,607	3,312	3,906	4,589	6,209	5,067	5,349	5,734	4,793	4,584	3,511	3,217	3,346	3,406
A.9 Percentage of Total	5.16	7.16	14.33	14.85	17.25	22.04	18.44	18.56	19.97	17.73	17.72	13.98	11.97	12.10	11.79
B Non-EPA Federal															
B.3 Air			132	152	146	119	108	96	123	131	64	96	73	96	85
B.4 Water	75	80	433	552	478	445	467	468	348	258	261	415	443	634	533
B.5 Land			56	53	42	24	34	23	25	29	19	52	218	311	366
B.6 Chemicals						2	28	83	27	17	16	8	15	33	45
B.7 Multi-Media				4	19	45	13	42	68	120	76	79	109	84	46
B.8 Total Non-EPA Federal	75	80	621	761	685	635	650	712	591	555	436	650	858	1,158	1,075
B.9 Percentage of Total	0.37	0.36	2.69	2.89	2.58	2.25	2.37	2.47	2.06	2.05	1.69	2.59	3.20	4.19	3.72
C State Government															
C.3 Air	160	196	211	184	264	312	304	385	487	507	539	442	421	329	312
C.4 Water	320	313	339	348	358	418	466	535	560	526	460	378	426	467	484
C.5 Land										4	19	22	43	44	33
C.6 Chemicals															
C.8 Total State Govt	481	510	550	532	622	730	770	920	1,047	1,037	1,018	842	889	840	829
C.9 Percentage of Total	2.38	2.27	2.38	2.02	2.34	2.59	2.80	3.19	3.65	3.84	3.94	3.35	3.31	3.04	2.87
D Local Government															
D.3 Air															
D.4 Water	4,718	3,552	2,948	2,678	1,717	1,387	1,668	1,972	2,636	2,811	2,862	3,514	3,194	2,999	3,729
D.5 Land	613	620	634	652	646	668	702	713	725	731	741	753	756	849	984
D.6 Chemicals															
D.7 Multi-Media															
D.8 Total Local Govt	5,331	4,172	3,582	3,330	2,363	2,054	2,370	2,685	3,361	3,542	3,602	4,267	3,950	3,849	4,714
D.9 Percentage of Total	26.36	18.58	15.50	12.66	8.88	7.29	8.62	9.32	11.70	13.10	13.92	16.99	14.70	13.92	16.32
E Private															
E.3 Air	5,262	7,192	7,073	9,758	9,643	9,608	9,593	10,286	10,003	10,049	9,557	9,236	10,559	10,871	10,976
E.4 Water	7,301	7,979	6,987	7,164	7,812	7,961	8,051	7,746	6,823	5,920	5,686	5,657	6,067	6,045	6,058
E.5 Land	733	911	980	847	887	980	963	1,126	1,157	1,140	944	926	1,203	1,427	1,709
E.6 Chemicals							20				43	23	121	120	117
E.7 Multi-Media															
E.8 Total Private	13,295	16,082	15,040	17,769	18,342	18,549	18,626	19,158	17,983	17,108	16,229	15,843	17,950	18,463	18,860
E.9 Percentage of Total	65.74	71.63	65.09	67.57	68.95	65.83	67.77	66.47	62.63	63.28	62.73	63.09	66.82	66.76	65.30
F Total Costs	20,225	22,451	23,105	26,297	26,600	28,178	27,484	28,825	28,715	27,036	25,870	25,113	26,864	27,656	28,884

Table 8-9E: TOTAL FEDERALLY-MANDATED COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	28,139	29,918	30,651	31,444	31,315	32,880	33,598	38,409	38,735	40,251	41,906	43,339	44,865	46,043	47,516
3.2	Radiation	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
3.3	Total Air & Radiation	28,505	30,257	31,012	31,837	31,743	33,337	34,086	38,930	39,288	40,837	42,526	43,995	45,556	46,767	48,274
4	Water															
4.1	Water Quality	37,535	39,905	41,019	42,912	45,218	47,535	49,606	51,781	53,958	56,169	58,370	60,560	62,740	64,910	67,069
4.2	Drinking Water	205	209	307	238	248	432	734	933	1,207	1,592	1,877	2,073	2,301	2,439	2,461
4.3	Total Water	37,740	40,114	41,326	43,150	45,466	47,967	50,340	52,714	55,165	57,761	60,247	62,633	65,041	67,349	69,530
5	Land															
5.1	Solid Waste	1,088	1,186	1,203	1,264	1,328	1,837	2,279	2,625	2,965	3,187	3,354	3,525	3,697	3,872	4,049
5.2	Hazardous Waste	1,436	1,762	3,155	3,727	4,604	6,083	7,564	8,315	9,160	9,848	10,131	10,977	11,721	12,473	13,194
5.3	LUST		1	13	1,444	3,482	4,140	4,734	5,301	3,988	3,634	3,692	3,751	5,008	4,713	4,733
5.4	RCRA	2,524	2,949	4,371	6,436	9,414	12,060	14,577	16,241	16,113	16,669	17,177	18,253	20,427	21,057	21,976
5.5	Superfund	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
5.6	Total Land	2,994	3,737	5,454	8,008	11,415	14,571	17,906	20,332	20,965	22,319	23,593	25,497	28,529	30,048	31,888
6	Chemicals															
6.1	Toxic Substances	419	385	480	605	669	891	1,074	1,209	1,224	1,241	1,298	1,318	1,333	1,345	1,364
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	838	839	934	1,301	1,648	1,976	2,244	2,466	2,528	2,594	2,705	2,783	2,849	2,927	3,022
7	Multi-Media	934	860	1,241	1,553	1,709	2,101	2,095	2,133	2,170	2,208	2,243	2,282	2,324	2,363	2,399
8	Total Costs	71,011	75,806	79,967	85,849	91,980	99,953	106,671	116,575	120,117	125,719	131,314	137,189	144,299	149,453	155,113
8.1	Percentage of GNP	1.66	1.71	1.73	1.80	1.96	2.09	2.19	2.34	2.37	2.43	2.49	2.55	2.64	2.68	2.74

Footnotes to Table 8-9E

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3G, 3-3H, 4-3E, 5-3G, 5-3H, 6-3E, and 7-3E).

Table 8-9D: TOTAL FEDERALLY-MANDATED COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
3.2	Radiation	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
3.3	Total Air & Radiation	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505
4	Water															
4.1	Water Quality	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,003	26,001	27,903	29,412	31,506	33,220	35,202	37,535
4.2	Drinking Water								172	176	181	186	190	195	200	205
4.3	Total Water	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,175	26,178	28,084	29,598	31,697	33,415	35,402	37,740
5	Land															
5.1	Solid Waste	490	516	573	635	679	727	759	881	932	910	875	877	949	1,052	1,088
5.2	Hazardous Waste										182	147	684	849	1,022	1,436
5.3	LUST															
5.4	RCRA	490	516	573	635	679	727	759	881	932	1,092	1,022	1,561	1,798	2,074	2,524
5.5	Superfund										16	65	125	265	361	471
5.6	Total Land	490	516	573	635	679	727	759	881	932	1,109	1,087	1,686	2,063	2,435	2,994
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	159	348	433	371	321	243	254	316	419
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	584	856	893	795	717	616	694	786	838
7	Multi-Media	108	139	461	587	729	921	905	889	873	702	615	702	671	702	934
8	Total Costs	18,182	21,939	25,289	28,575	33,173	37,681	41,526	45,527	48,557	51,148	53,142	57,963	61,877	65,734	71,011
8.1	Percentage of GNP	0.61	0.69	0.81	0.92	1.02	1.11	1.16	1.24	1.32	1.37	1.46	1.54	1.54	1.58	1.66

Footnotes to Table 8-9D

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding ten percent annualized cost tables in each media chapter (Tables 3-3F, 4-3D, 5-3F, 6-3D, and 7-3D).

Table 8-9C: TOTAL FEDERALLY-MANDATED COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	21,414	22,804	23,154	23,598	23,128	24,369	25,016	29,877	30,314	31,985	33,779	35,326	36,967	38,269	39,876
3.2	Radiation	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
3.3	Total Air & Radiation	21,755	23,116	23,485	23,957	23,517	24,785	25,458	30,346	30,811	32,510	34,334	35,910	37,580	38,910	40,545
4	Water															
4.1	Water Quality	26,414	28,060	28,539	29,812	31,406	33,032	34,412	35,905	37,406	38,944	40,475	42,000	43,519	45,031	46,537
4.2	Drinking Water	189	191	285	212	218	384	642	782	986	1,286	1,482	1,609	1,806	1,935	1,947
4.3	Total Water	26,602	28,251	28,824	30,025	31,624	33,416	35,054	36,687	38,392	40,230	41,957	43,609	45,324	46,965	48,484
5	Land															
5.1	Solid Waste	989	1,075	1,079	1,126	1,175	1,561	1,859	2,120	2,378	2,517	2,625	2,734	2,844	2,956	3,069
5.2	Hazardous Waste	1,380	1,681	2,985	3,435	4,164	5,526	6,805	7,358	7,975	8,458	8,529	9,138	9,676	10,219	10,728
5.3	LUST		1	13	1,155	2,904	3,226	3,531	3,809	2,471	2,091	2,124	2,158	2,769	2,468	2,483
5.4	RCRA	2,370	2,757	4,077	5,716	8,243	10,313	12,195	13,287	12,825	13,067	13,278	14,030	15,289	15,642	16,280
5.5	Superfund	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
5.6	Total Land	2,695	3,320	4,830	6,804	9,603	11,987	14,417	15,969	15,944	16,644	17,276	18,497	20,244	21,101	22,263
6	Chemicals															
6.1	Toxic Substances	383	341	428	504	519	691	825	952	962	975	1,028	1,043	1,055	1,066	1,080
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	802	795	882	1,200	1,498	1,777	1,995	2,209	2,267	2,328	2,434	2,508	2,571	2,647	2,738
7	Multi-Media	898	822	1,108	1,400	1,479	1,871	1,865	1,902	1,940	1,978	2,014	2,055	2,098	2,139	2,178
8	Total Costs	52,753	56,303	59,128	63,386	67,722	73,836	78,789	87,114	89,355	93,690	98,014	102,579	107,816	111,762	116,208
8.1	Percentage of GNP	1.23	1.27	1.28	1.33	1.45	1.54	1.61	1.75	1.76	1.81	1.86	1.91	1.97	2.01	2.05

Footnotes to Table 8-9C

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3D, 3-3E, 4-3C, 5-3D, 5-3E, 6-3C, and 7-3C).

Table 8-9B: TOTAL FEDERALLY-MANDATED COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	7,769	9,235	9,380	10,110	11,447	12,941	14,151	15,008	15,462	15,744	15,911	17,619	18,881	19,828	21,414
3.2	Radiation	18	17	255	231	156	171	234	229	214	193	212	198	204	221	341
3.3	Total Air & Radiation	7,787	9,251	9,635	10,341	11,603	13,112	14,386	15,237	15,676	15,937	16,123	17,817	19,085	20,050	21,755
4	Water															
4.1	Water Quality	8,734	9,847	11,299	12,443	14,161	15,515	16,589	17,835	19,007	20,181	20,993	22,408	23,458	24,778	26,414
4.2	Drinking Water								170	172	175	178	180	183	186	189
4.3	Total Water	8,734	9,847	11,299	12,443	14,161	15,515	16,589	18,005	19,179	20,356	21,171	22,588	23,641	24,964	26,602
5	Land															
5.1	Solid Waste	486	509	559	615	653	695	721	838	883	855	814	809	871	964	989
5.2	Hazardous Waste										182	147	681	840	994	1,380
5.3	LUST															
5.4	RCRA	486	509	559	615	653	695	721	838	883	1,037	961	1,491	1,712	1,958	2,370
5.5	Superfund										14	52	96	200	255	326
5.6	Total Land	486	509	559	615	653	695	721	838	883	1,051	1,013	1,586	1,912	2,214	2,695
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	157	341	425	362	309	229	234	288	383
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	581	849	885	786	705	603	674	758	802
7	Multi-Media	108	139	461	587	728	917	901	883	863	686	596	679	642	669	898
8	Total Costs	17,207	19,889	22,138	24,167	27,495	30,648	33,178	35,812	37,486	38,816	39,608	43,274	45,954	48,654	52,753
8.1	Percentage of GNP	0.57	0.63	0.70	0.78	0.85	0.90	0.93	0.97	1.02	1.04	1.09	1.15	1.14	1.17	1.23

Footnotes to Table 8-9B

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding three percent annualized cost tables in each media chapter (Tables 3-3C, 4-3B, 5-3C, 6-3B, and 7-3B).

Table 8-9A: TOTAL FEDERALLY-MANDATED COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	25,077	26,679	27,238	27,872	27,588	29,005	29,692	34,528	34,905	36,493	38,212	39,699	41,278	42,513	44,049
3.2	Radiation	354	326	347	377	410	438	467	497	528	559	590	622	654	685	717
3.3	Total Air & Radiation	25,431	27,005	27,585	28,249	27,998	29,443	30,159	35,025	35,433	37,051	38,802	40,321	41,932	43,198	44,765
4	Water															
4.1	Water Quality	32,386	34,421	35,241	36,847	38,823	40,820	42,571	44,430	46,295	48,194	50,085	51,967	53,840	55,706	57,563
4.2	Drinking Water	197	201	297	226	234	410	692	864	1,105	1,452	1,696	1,860	2,074	2,208	2,225
4.3	Total Water	32,583	34,622	35,538	37,073	39,057	41,230	43,263	45,294	47,400	49,645	51,780	53,827	55,914	57,913	59,788
5	Land															
5.1	Solid Waste	1,043	1,135	1,146	1,201	1,258	1,710	2,086	2,393	2,696	2,880	3,019	3,162	3,305	3,451	3,599
5.2	Hazardous Waste	1,410	1,725	3,077	3,593	4,402	5,827	7,216	7,875	8,616	9,210	9,396	10,133	10,782	11,438	12,062
5.3	LUST		1	13	1,311	3,215	3,716	4,177	4,611	3,286	2,920	2,966	3,014	3,972	3,673	3,691
5.4	RCRA	2,453	2,861	4,236	6,104	8,874	11,254	13,479	14,879	14,598	15,009	15,381	16,308	18,059	18,563	19,352
5.5	Superfund	404	683	930	1,348	1,704	2,124	2,816	3,439	4,050	4,690	5,296	5,958	6,645	7,355	8,093
5.6	Total Land	2,856	3,545	5,166	7,452	10,579	13,378	16,295	18,318	18,648	19,699	20,677	22,266	24,704	25,918	27,445
6	Chemicals															
6.1	Toxic Substances	402	365	456	558	600	799	960	1,091	1,104	1,119	1,174	1,192	1,206	1,217	1,234
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	822	819	910	1,255	1,579	1,885	2,130	2,348	2,408	2,472	2,580	2,657	2,721	2,799	2,892
7	Multi-Media	918	842	1,180	1,483	1,603	1,995	1,989	2,027	2,065	2,102	2,138	2,177	2,220	2,260	2,298
8	Total Costs	62,610	66,832	70,378	75,512	80,816	87,932	93,837	103,012	105,953	110,969	115,978	121,248	127,492	132,088	137,188
8.1	Percentage of GNP	1.46	1.51	1.52	1.58	1.73	1.84	1.92	2.07	2.09	2.14	2.20	2.26	2.33	2.37	2.42

Footnotes to Table 8-9A

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding seven percent annualized cost tables in each media chapter (Tables 3-3A, 3-3B, 4-3A, 5-3A, 5-3B, 6-3A, and 7-3A).

Table 8-9: TOTAL FEDERALLY-MANDATED COSTS ASSUMING FULL IMPLEMENTATION ANNUALIZED AT 7 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	7,916	9,581	9,927	10,925	12,528	14,287	15,761	16,902	17,635	18,196	18,624	20,573	22,109	23,279	25,077
3.2	Radiation	18	17	255	232	158	173	237	232	219	201	220	207	215	233	354
3.3	Total Air & Radiation	7,934	9,598	10,182	11,156	12,686	14,460	15,998	17,134	17,854	18,397	18,844	20,780	22,324	23,513	25,431
4	Water															
4.1	Water Quality	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,147	22,763	24,328	25,514	27,294	28,700	30,376	32,386
4.2	Drinking Water								171	175	178	182	186	190	193	197
4.3	Total Water	9,110	10,600	12,441	13,991	16,125	17,940	19,455	21,318	22,938	24,506	25,696	27,480	28,890	30,569	32,583
5	Land															
5.1	Solid Waste	488	513	567	626	667	713	742	861	909	885	847	846	913	1,012	1,043
5.2	Hazardous Waste										182	147	683	845	1,009	1,410
5.3	LUST															
5.4	RCRA	488	513	567	626	667	713	742	861	909	1,067	994	1,529	1,758	2,021	2,453
5.5	Superfund										15	59	112	235	312	404
5.6	Total Land	488	513	567	626	667	713	742	861	909	1,082	1,053	1,640	1,993	2,333	2,856
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	158	345	429	367	315	237	245	303	402
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	583	853	889	791	712	610	685	773	822
7	Multi-Media	108	139	461	587	729	919	903	886	868	695	606	692	657	687	918
8	Total Costs	17,732	20,993	23,835	26,542	30,556	34,440	37,680	41,052	43,459	45,470	46,911	51,202	54,550	57,875	62,610
8.1	Percentage of GNP	0.59	0.66	0.76	0.86	0.94	1.01	1.05	1.12	1.18	1.22	1.29	1.36	1.35	1.39	1.46

Footnotes to Table 8-9

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding seven percent annualized cost tables (those ending in "-3") in each media chapter, starting with Table 3-3 and ending with Table 7-3.

Table 8-8A: TOTAL FEDERALLY-MANDATED OPERATING COSTS ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air	9,731	10,427	10,083	9,916	8,823	9,480	9,863	14,655	15,170	16,997	18,935	20,568	22,303	23,686	25,386
3.2	Radiation	314	281	297	322	348	370	391	414	437	459	482	505	527	550	573
3.3	Total Air & Radiation	10,045	10,708	10,380	10,237	9,171	9,850	10,255	15,069	15,607	17,457	19,417	21,072	22,830	24,236	25,959
4	Water															
4.1	Water Quality	16,109	17,085	16,975	17,674	18,608	19,595	20,333	21,195	22,068	22,982	23,893	24,802	25,708	26,611	27,512
4.2	Drinking Water	167	167	256	178	179	319	519	580	691	878	953	990	1,143	1,259	1,259
4.3	Total Water	16,276	17,252	17,231	17,852	18,786	19,913	20,852	21,775	22,759	23,860	24,846	25,791	26,850	27,870	28,771
5	Land															
5.1	Solid Waste	857	926	912	941	969	1,192	1,296	1,446	1,594	1,621	1,649	1,676	1,704	1,731	1,758
5.2	Hazardous Waste	1,306	1,574	2,758	3,043	3,576	4,780	5,790	6,077	6,390	6,599	6,386	6,676	6,940	7,203	7,430
5.3	LUST		1	13	888	2,368	2,379	2,416	2,427	1,066	662	672	683	694	387	397
5.4	RCRA	2,164	2,501	3,684	4,871	6,913	8,351	9,503	9,949	9,050	8,882	8,707	9,035	9,337	9,321	9,585
5.5	Superfund	191	353	447	641	767	899	1,197	1,376	1,514	1,656	1,757	1,895	2,038	2,186	2,342
5.6	Total Land	2,355	2,854	4,131	5,512	7,680	9,250	10,700	11,325	10,564	10,538	10,464	10,930	11,375	11,507	11,927
6	Chemicals															
6.1	Toxic Substances	335	283	359	369	318	425	492	608	613	619	666	674	683	692	700
6.2	Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Total Chemicals	754	736	813	1,066	1,297	1,510	1,662	1,865	1,917	1,972	2,072	2,140	2,199	2,273	2,358
7	Multi-Media	851	772	930	1,196	1,172	1,563	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883
8	Total Costs	30,280	32,322	33,484	35,863	38,106	42,086	45,025	51,629	52,479	55,497	58,507	61,685	65,049	67,727	70,898

Footnotes to Table 8-8A

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1986-2000. Estimates are taken from the corresponding program totals of the corresponding operating cost tables (those ending in "-2A" and "-2B") in each section, starting with Table 3-2A and ending with Table 7-2A.

Table 8-8: TOTAL FEDERALLY-MANDATED OPERATING COSTS ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air	7,392	8,332	7,957	7,871	8,370	9,013	9,368	9,302	8,861	8,221	7,536	8,415	8,685	8,869	9,731
3.2	Radiation	18	17	253	228	153	168	229	222	204	178	195	179	183	197	314
3.3	Total Air & Radiation	7,409	8,349	8,210	8,099	8,523	9,180	9,597	9,524	9,065	8,399	7,731	8,594	8,868	9,066	10,045
4	Water															
4.1	Water Quality	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,121	12,526	13,026	13,191	13,976	14,413	15,119	16,109
4.2	Drinking Water								167	167	167	167	167	167	167	167
4.3	Total Water	8,085	8,547	9,328	9,771	10,772	11,330	11,644	12,288	12,693	13,193	13,358	14,143	14,580	15,286	16,276
5	Land															
5.1	Solid Waste	482	499	541	587	617	653	671	780	816	780	733	719	767	846	857
5.2	Hazardous Waste										182	147	677	828	958	1,306
5.3	LUST															
5.4	RCRA	482	499	541	587	617	653	671	780	816	962	880	1,396	1,596	1,804	2,164
5.5	Superfund										12	40	69	140	157	191
5.6	Total Land	482	499	541	587	617	653	671	780	816	974	920	1,465	1,736	1,961	2,355
6	Chemicals															
6.1	Toxic Substances			9	5	9	47	154	332	414	350	293	212	207	251	335
6.2	Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Total Chemicals	92	143	183	181	349	408	578	840	874	774	690	585	647	721	754
7	Multi-Media	108	139	461	587	726	913	896	875	850	665	570	648	603	625	851
8	Total Costs	16,176	17,677	18,723	19,226	20,989	22,484	23,385	24,306	24,299	24,005	23,269	25,436	26,434	27,658	30,280

Footnotes to Table 8-8

Total federally-mandated operating costs for implementing existing and new regulations for all media for the years 1972-1986. Estimates are taken from the corresponding program totals of the corresponding operating cost tables (those ending in "-2") in each section, starting with Table 3-2 and ending with Table 7-2.

Table 8-17B (cont'd): TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REG ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,662	12,645	12,973	14,139	14,935	16,184
5.4.2	New Regs															190
5.4.3	Total RCRA	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,662	12,645	12,973	14,139	14,935	16,374
5.5	Superfund															
5.5.1	Existing Regs										14	52	96	200	255	326
5.5.2	New Regs															
5.5.3	Total Superfund										14	52	96	200	255	326
5.6	Land															
5.6.1	Existing Regs	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,676	12,697	13,069	14,339	15,190	16,510
5.6.2	New Regs															190
5.6.3	Total Land	8,399	8,820	9,225	9,625	10,181	11,076	11,620	12,630	13,209	13,676	12,697	13,069	14,339	15,190	16,700
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs			9	5	9	47	157	341	425	362	309	229	234	288	377
6.1.2	New Regs															6
6.1.3	Total Toxic Subs			9	5	9	47	157	341	425	362	309	229	234	288	383
6.2	Pesticides															
6.2.1	Existing Regs	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.2.3	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Chemicals															
6.3.1	Existing Regs	92	143	183	181	349	408	581	849	885	786	705	603	674	758	796
6.3.2	New Regs															6
6.3.3	Total Chemicals	92	143	183	181	349	408	581	849	885	786	705	603	674	758	802
7	Multi-Media	108	139	461	587	728	917	901	883	863	686	596	679	642	669	898
8	Annualized Costs															
8.3	Total Full Impl															
8.4	Total Annualized Costs	25,901	29,042	31,737	34,222	38,203	42,344	45,542	49,072	51,408	53,221	53,200	56,751	60,462	63,860	69,164

Footnotes to Table 8-17B

Sum of the annualized costs in Tables 3-3C, 4-3B, 5-3C, 6-3B, and 7-3B.

Table 8-17C: TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	21,414	22,772	23,062	23,310	22,805	23,770	24,268	24,656	24,909	25,081	25,229	25,458	25,668	25,874	26,047
3.1.2	New Regs		32	92	288	323	599	747	853	1,006	2,315	3,538	4,435	5,445	6,119	7,275
3.1.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.1.4	Total Air	21,414	22,804	23,154	23,598	23,128	24,369	25,016	29,877	30,314	31,985	33,779	35,326	36,967	38,269	39,876
3.2	Radiation															
3.2.1	Existing Regs	341	311	330	359	389	415	442	470	498	526	554	583	612	640	669
3.2.2	New Regs	0	1	5	15	25	36	47	58	69	81	93	105	117	130	143
3.2.3	Total Radiation	341	312	335	374	415	452	489	528	567	607	647	688	730	770	812
3.3	Air & Radiation															
3.3.1	Existing Regs	21,755	23,084	23,392	23,669	23,194	24,186	24,710	25,126	25,407	25,607	25,784	26,041	26,281	26,514	26,716
3.3.2	New Regs	0	33	97	303	349	635	794	911	1,076	2,396	3,631	4,540	5,562	6,249	7,418
3.3.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.3.4	Total Air & Radiation	21,755	23,116	23,490	23,972	23,543	24,821	25,505	30,404	30,881	32,591	34,426	36,014	37,697	39,040	40,688
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	26,414	28,060	28,521	29,638	30,801	31,923	32,942	33,987	35,006	36,000	36,992	37,982	38,969	39,954	40,936
4.1.2	New Regs			18	174	340	569	585	618	618	618	618	618	618	618	618
4.1.3	Full Implementation					265	541	885	1,301	1,782	2,325	2,865	3,400	3,931	4,459	4,983
4.1.4	Total Water Quality	26,414	28,060	28,539	29,812	31,406	33,032	34,412	35,905	37,406	38,944	40,475	42,000	43,519	45,031	46,537
4.2	Drinking Water															
4.2.1	Existing Regs	2,595	2,693	2,709	2,747	2,879	3,010	3,107	3,190	3,268	3,345	3,424	3,510	3,598	3,676	3,726
4.2.2	New Regs			91	185	191	357	615	755	959	1,260	1,455	1,583	1,779	1,910	1,926
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	2,595	2,693	2,801	2,932	3,070	3,367	3,723	3,945	4,228	4,604	4,879	5,093	5,376	5,586	5,652
4.3	Water															
4.3.1	Existing Regs	29,009	30,754	31,230	32,385	33,679	34,933	36,049	37,177	38,274	39,345	40,416	41,492	42,567	43,630	44,663
4.3.2	New Regs			109	359	531	926	1,200	1,373	1,577	1,877	2,073	2,201	2,397	2,528	2,543
4.3.3	Full Implementation					265	541	885	1,301	1,782	2,325	2,865	3,400	3,931	4,459	4,983
4.3.4	Total Water	29,009	30,754	31,340	32,745	34,476	36,399	38,134	39,851	41,634	43,548	45,354	47,093	48,895	50,617	52,189
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	14,994	15,920	15,482	15,890	16,300	16,710	17,030	17,338	17,639	17,948	18,257	18,560	18,863	19,155	19,446
5.1.2	New Regs						337	590	804	1,018	1,111	1,170	1,229	1,288	1,347	1,406
5.1.3	Total Solid Waste	14,994	15,920	15,482	15,890	16,300	17,048	17,619	18,143	18,657	19,059	19,427	19,789	20,150	20,502	20,851
5.2	Hazardous Waste															
5.2.1	Existing Regs	1,191	1,388	1,541	1,880	2,148	2,497	3,164	3,588	4,046	4,390	4,756	5,153	5,553	5,958	6,365
5.2.2	New Regs	190	293	1,444	1,555	2,016	3,029	3,642	3,770	3,930	4,068	3,773	3,985	4,123	4,261	4,363
5.2.3	Total Hazardous Waste	1,380	1,681	2,985	3,435	4,164	5,526	6,805	7,358	7,975	8,458	8,529	9,138	9,676	10,219	10,728

(continued on next page)

Table 8-17C (cont'd): TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REG ANNUALIZED AT 3 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
5.3.2	New Regs				1,126	2,874	3,185	3,479	3,747	2,400	2,010	2,033	2,058	2,658	2,347	2,352
5.3.3	Total LUST		1	13	1,155	2,904	3,226	3,531	3,809	2,471	2,091	2,124	2,158	2,769	2,468	2,483
5.4	RCRA															
5.4.1	Existing Regs	16,184	17,309	17,036	17,800	18,479	19,248	20,246	20,988	21,756	22,419	23,105	23,814	24,527	25,233	25,941
5.4.2	New Regs	190	293	1,444	2,681	4,889	6,551	7,710	8,322	7,347	7,189	6,976	7,271	8,069	7,955	8,121
5.4.3	Total RCRA	16,374	17,603	18,480	20,480	23,369	25,799	27,956	29,310	29,104	29,609	30,080	31,085	32,595	33,188	34,062
5.5	Superfund															
5.5.1	Existing Regs	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
5.5.2	New Regs															
5.5.3	Total Superfund	326	562	753	1,089	1,361	1,675	2,222	2,682	3,119	3,577	3,998	4,467	4,955	5,459	5,983
5.6	Land															
5.6.1	Existing Regs	16,510	17,872	17,789	18,888	19,840	20,922	22,468	23,670	24,876	25,996	27,102	28,282	29,481	30,692	31,924
5.6.2	New Regs	190	293	1,444	2,681	4,889	6,551	7,710	8,322	7,347	7,189	6,976	7,271	8,069	7,955	8,121
5.6.3	Total Land	16,700	18,165	19,233	21,569	24,729	27,474	30,178	31,992	32,223	33,186	34,078	35,552	37,550	38,647	40,045
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	377	341	348	364	339	392	407	424	432	444	455	468	477	485	496
6.1.2	New Regs	6		80	140	180	299	418	528	530	531	572	575	578	581	584
6.1.3	Total Toxic Subs	383	341	428	504	519	691	825	952	962	975	1,028	1,043	1,055	1,066	1,080
6.2	Pesticides															
6.2.1	Existing Regs	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.2.3	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Chemicals															
6.3.1	Existing Regs	796	795	802	1,061	1,318	1,477	1,577	1,681	1,737	1,797	1,862	1,933	1,993	2,066	2,154
6.3.2	New Regs	6		80	140	180	299	418	528	530	531	572	575	578	581	584
6.3.3	Total Chemicals	802	795	882	1,200	1,498	1,777	1,995	2,209	2,267	2,328	2,434	2,508	2,571	2,647	2,738
7	Multi-Media	898	822	1,108	1,400	1,479	1,871	1,865	1,902	1,940	1,978	2,014	2,055	2,098	2,139	2,178
8	Annualized Costs															
8.1	Total Existing Regs	68,968	73,326	74,321	77,404	79,510	83,389	86,669	89,556	92,234	94,722	97,178	99,802	102,419	105,041	107,635
8.2	Total New Regs	196	326	1,731	3,483	5,949	8,411	10,123	11,134	10,531	11,994	13,251	14,586	16,606	17,314	18,667
8.3	Total Full Impl					265	541	885	5,669	6,180	6,914	7,877	8,834	9,785	10,735	11,537
8.4	Total Annualized Costs	69,164	73,652	76,052	80,887	85,724	92,341	97,677	106,358	108,945	113,630	118,306	123,222	128,810	133,090	137,838

Footnotes to Table 8-17C

Sum of the annualized costs in Tables 3-3D, 3-3E, 4-3C, 5-3D, 5-3E, 6-3C, and 7-3C.

Table 8-17D: TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
3.1.2	New Regs															
3.1.3	Full Implementation															
3.1.4	Total Air	8,041	9,874	10,389	11,612	13,438	15,419	17,113	18,491	19,457	20,252	20,897	23,046	24,811	26,165	28,139
3.2	Radiation															
3.2.1	Existing Regs	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
3.2.2	New Regs															0
3.2.3	Total Radiation	18	17	256	233	159	175	239	235	223	207	228	216	224	244	366
3.3	Air & Radiation															
3.3.1	Existing Regs	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505
3.3.2	New Regs															0
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	8,058	9,891	10,645	11,845	13,597	15,594	17,353	18,726	19,681	20,459	21,124	23,261	25,034	26,409	28,505
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,003	26,001	27,903	29,412	31,506	33,220	35,202	37,535
4.1.2	New Regs															
4.1.3	Full Implementation															
4.1.4	Total Water Quality	9,434	11,250	13,426	15,326	17,818	20,031	21,926	24,003	26,001	27,903	29,412	31,506	33,220	35,202	37,535
4.2	Drinking Water															
4.2.1	Existing Regs	819	918	1,053	1,211	1,391	1,567	1,758	1,980	2,164	2,404	2,587	2,722	2,858	3,062	3,305
4.2.2	New Regs															
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	819	918	1,053	1,211	1,391	1,567	1,758	1,980	2,164	2,404	2,587	2,722	2,858	3,062	3,305
4.3	Water															
4.3.1	Existing Regs	10,253	12,168	14,479	16,537	19,209	21,598	23,683	25,983	28,165	30,307	31,999	34,229	36,079	38,264	40,840
4.3.2	New Regs															
4.3.3	Full Implementation															
4.3.4	Total Water	10,253	12,168	14,479	16,537	19,209	21,598	23,683	25,983	28,165	30,307	31,999	34,229	36,079	38,264	40,840
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,319	13,423	13,297	14,396	15,135	16,294
5.1.2	New Regs															
5.1.3	Total Solid Waste	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,319	13,423	13,297	14,396	15,135	16,294
5.2	Hazardous Waste															
5.2.1	Existing Regs										182	147	684	849	1,022	1,229
5.2.2	New Regs															207
5.2.3	Total Hazardous Waste										182	147	684	849	1,022	1,436

(continued on next page)

Table 8-17D (cont'd): TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REG ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,502	13,570	13,981	15,246	16,156	17,523
5.4.2	New Regs															207
5.4.3	Total RCRA	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,502	13,570	13,981	15,246	16,156	17,730
5.5	Superfund															
5.5.1	Existing Regs										16	65	125	265	361	471
5.5.2	New Regs															
5.5.3	Total Superfund										16	65	125	265	361	471
5.6	Land															
5.6.1	Existing Regs	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,518	13,635	14,106	15,510	16,518	17,996
5.6.2	New Regs															207
5.6.3	Total Land	8,467	8,964	9,453	9,931	10,566	11,546	12,175	13,278	13,953	14,518	13,635	14,106	15,510	16,518	18,200
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs			9	5	9	47	159	348	433	371	321	243	254	316	413
6.1.2	New Regs															6
6.1.3	Total Toxic Subs			9	5	9	47	159	348	433	371	321	243	254	316	419
6.2	Pesticides															
6.2.1	Existing Regs	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.2.3	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Chemicals															
6.3.1	Existing Regs	92	143	183	181	349	408	584	856	893	795	717	616	694	786	832
6.3.2	New Regs															6
6.3.3	Total Chemicals	92	143	183	181	349	408	584	856	893	795	717	616	694	786	838
7	Multi-Media	108	139	461	587	729	921	905	889	873	702	615	702	671	702	934
8	Annualized Costs															
8.3	Total Full Impl															
8.4	Total Annualized Costs	26,978	31,305	35,222	39,082	44,451	50,067	54,699	59,732	63,566	66,781	68,091	72,916	77,988	82,679	89,318

Footnotes to Table 8-17D

Sum of the annualized costs in Tables 3-3F, 4-3D, 5-3F, 6-3D, and 7-3D.

Table 8-17E: TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REGULATION ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	28,139	29,862	30,507	31,075	30,902	32,179	32,736	33,067	33,200	33,208	33,208	33,313	33,404	33,480	33,514
3.1.2	New Regs		56	145	368	414	701	862	974	1,137	2,454	3,686	4,592	5,608	6,287	7,448
3.1.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.1.4	Total Air	28,139	29,918	30,651	31,444	31,315	32,880	33,598	38,409	38,735	40,251	41,906	43,339	44,865	46,043	47,516
3.2	Radiation															
3.2.1	Existing Regs	366	339	361	393	427	457	488	521	553	587	621	655	690	723	758
3.2.2	New Regs	0	1	7	21	36	52	67	83	99	116	134	152	170	190	210
3.2.3	Total Radiation	366	340	368	414	463	509	555	603	653	703	755	807	861	913	967
3.3	Air & Radiation															
3.3.1	Existing Regs	28,505	30,201	30,868	31,468	31,329	32,636	33,224	33,588	33,753	33,795	33,828	33,969	34,094	34,204	34,271
3.3.2	New Regs	0	57	152	390	449	753	929	1,057	1,236	2,570	3,820	4,744	5,778	6,477	7,658
3.3.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.3.4	Total Air & Radiation	28,505	30,258	31,019	31,858	31,778	33,389	34,153	39,013	39,387	40,954	42,660	44,146	45,726	46,956	48,483
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	37,535	39,905	40,984	42,704	44,463	46,174	47,753	49,328	50,848	52,318	53,783	55,242	56,697	58,147	59,592
4.1.2	New Regs			35	209	393	623	645	678	678	678	678	678	678	678	678
4.1.3	Full Implementation					362	738	1,208	1,775	2,432	3,173	3,909	4,640	5,365	6,085	6,799
4.1.4	Total Water Quality	37,535	39,905	41,019	42,912	45,218	47,535	49,606	51,781	53,958	56,169	58,370	60,560	62,740	64,910	67,069
4.2	Drinking Water															
4.2.1	Existing Regs	3,305	3,465	3,538	3,634	3,825	4,016	4,138	4,244	4,342	4,437	4,537	4,650	4,763	4,862	4,928
4.2.2	New Regs			93	191	201	385	687	886	1,160	1,545	1,830	2,026	2,254	2,397	2,424
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	3,305	3,465	3,632	3,825	4,025	4,401	4,825	5,130	5,502	5,982	6,367	6,676	7,017	7,259	7,351
4.3	Water															
4.3.1	Existing Regs	40,840	43,370	44,522	46,338	48,287	50,190	51,890	53,572	55,191	56,755	58,320	59,892	61,460	63,008	64,519
4.3.2	New Regs			129	399	594	1,008	1,333	1,564	1,838	2,223	2,508	2,704	2,932	3,075	3,102
4.3.3	Full Implementation					362	738	1,208	1,775	2,432	3,173	3,909	4,640	5,365	6,085	6,799
4.3.4	Total Water	40,840	43,370	44,651	46,737	49,243	51,936	54,431	56,911	59,460	62,151	64,737	67,236	69,758	72,168	74,420
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	16,294	17,330	16,991	17,500	18,011	18,522	18,877	19,212	19,533	19,869	20,204	20,529	20,853	21,160	21,463
5.1.2	New Regs						443	826	1,110	1,393	1,555	1,658	1,761	1,864	1,967	2,070
5.1.3	Total Solid Waste	16,294	17,330	16,991	17,500	18,011	18,966	19,703	20,322	20,926	21,424	21,862	22,291	22,718	23,127	23,533
5.2	Hazardous Waste															
5.2.1	Existing Regs	1,229	1,445	1,620	2,023	2,370	2,816	3,665	4,281	4,946	5,484	6,040	6,629	7,225	7,827	8,435
5.2.2	New Regs	207	317	1,535	1,704	2,234	3,267	3,899	4,034	4,214	4,364	4,091	4,348	4,497	4,646	4,759
5.2.3	Total Hazardous Waste	1,436	1,762	3,155	3,727	4,604	6,083	7,564	8,315	9,160	9,848	10,131	10,977	11,721	12,473	13,194

(continued on next page)

Table 8-17E (cont'd): TOTAL COSTS ASSUMING FULL IMPLEMENTATION BY TYPE OF REG ANNUALIZED AT 10 PERCENT

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
5.3.2	New Regs				1,415	3,452	4,099	4,682	5,239	3,917	3,552	3,601	3,650	4,898	4,592	4,603
5.3.3	Total LUST		1	13	1,444	3,482	4,140	4,734	5,301	3,988	3,634	3,692	3,751	5,008	4,713	4,733
5.4	RCRA															
5.4.1	Existing Regs	17,523	18,776	18,624	19,552	20,411	21,379	22,594	23,555	24,550	25,434	26,335	27,260	28,189	29,107	30,028
5.4.2	New Regs	207	317	1,535	3,119	5,686	7,809	9,407	10,384	9,524	9,472	9,350	9,760	11,259	11,206	11,433
5.4.3	Total RCRA	17,730	19,093	20,159	22,671	26,097	29,189	32,001	33,939	34,075	34,906	35,685	37,019	39,448	40,313	41,461
5.5	Superfund															
5.5.1	Existing Regs	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
5.5.2	New Regs															
5.5.3	Total Superfund	471	788	1,083	1,572	2,001	2,512	3,329	4,091	4,852	5,650	6,416	7,244	8,102	8,990	9,913
5.6	Land															
5.6.1	Existing Regs	17,994	19,564	19,707	21,124	22,412	23,891	25,923	27,646	29,402	31,084	32,751	34,503	36,291	38,097	39,940
5.6.2	New Regs	207	317	1,535	3,119	5,686	7,809	9,407	10,384	9,524	9,472	9,350	9,760	11,259	11,206	11,433
5.6.3	Total Land	18,200	19,881	21,242	24,244	28,098	31,700	35,330	38,030	38,927	40,556	42,101	44,263	47,550	49,303	51,373
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	413	385	400	423	406	466	489	514	527	543	559	576	588	597	613
6.1.2	New Regs	6		80	181	263	424	585	695	697	698	739	742	745	748	751
6.1.3	Total Toxic Subs	419	385	480	605	669	891	1,074	1,209	1,224	1,241	1,298	1,318	1,333	1,345	1,364
6.2	Pesticides															
6.2.1	Existing Regs	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.2.3	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Chemicals															
6.3.1	Existing Regs	832	839	854	1,120	1,385	1,552	1,659	1,771	1,831	1,896	1,966	2,041	2,104	2,179	2,271
6.3.2	New Regs	6		80	181	263	424	585	695	697	698	739	742	745	748	751
6.3.3	Total Chemicals	838	839	934	1,301	1,648	1,976	2,244	2,466	2,528	2,594	2,705	2,783	2,849	2,927	3,022
7	Multi-Media	934	860	1,241	1,553	1,709	2,101	2,095	2,133	2,170	2,208	2,243	2,282	2,324	2,363	2,399
8	Annualized Costs															
8.1	Total Existing Regs	89,105	94,832	97,191	101,603	105,122	110,370	114,791	118,710	122,348	125,737	129,108	132,686	136,273	139,851	143,401
8.2	Total New Regs	213	374	1,895	4,090	6,992	9,995	12,254	13,700	13,295	14,963	16,417	17,949	20,714	21,506	22,944
8.3	Total Full Impl					362	738	1,208	6,143	6,830	7,762	8,921	10,074	11,219	12,361	13,353
8.4	Total Annualized Costs	89,318	95,206	99,086	105,693	112,476	121,102	128,253	138,553	142,473	148,462	154,446	160,710	168,207	173,718	179,698

Footnotes to Table 8-17E

Sum of the annualized costs in Tables 3-3G, 3-3H, 4-3E, 5-3G, 5-3H, 6-3E, and 7-3E.

Table 8-18: TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	12,814	15,720	15,349	17,945	18,407	19,044	19,348	20,047	19,410	18,819	17,666	18,152	19,705	20,110	21,056
3.1.2	New Regs															
3.1.3	Full Implementation															
3.1.4	Total Air	12,814	15,720	15,349	17,945	18,407	19,044	19,348	20,047	19,410	18,819	17,666	18,152	19,705	20,110	21,056
3.2	Radiation															
3.2.1	Existing Regs	18	17	277	248	169	176	254	244	268	267	225	216	216	252	361
3.2.2	New Regs															1
3.2.3	Total Radiation	18	17	277	248	169	176	254	244	268	267	225	216	216	252	362
3.3	Air & Radiation															
3.3.1	Existing Regs	12,832	15,737	15,627	18,193	18,576	19,220	19,602	20,291	19,678	19,085	17,891	18,368	19,921	20,362	21,417
3.3.2	New Regs															1
3.3.3	Full Implementation															
3.3.4	Total Air & Radiation	12,832	15,737	15,627	18,193	18,576	19,220	19,602	20,291	19,678	19,085	17,891	18,368	19,921	20,362	21,418
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	20,806	21,308	22,479	23,502	24,831	26,935	26,539	27,211	27,545	26,236	25,858	26,321	26,455	27,142	28,774
4.1.2	New Regs															
4.1.3	Full Implementation															
4.1.4	Total Water Quality	20,806	21,308	22,479	23,502	24,831	26,935	26,539	27,211	27,545	26,236	25,858	26,321	26,455	27,142	28,774
4.2	Drinking Water															
4.2.1	Existing Regs	1,468	1,512	1,641	1,741	1,794	1,793	1,898	2,160	2,319	2,413	2,433	2,378	2,386	2,622	2,896
4.2.2	New Regs															
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	1,468	1,512	1,641	1,741	1,794	1,793	1,898	2,160	2,319	2,413	2,433	2,378	2,386	2,622	2,896
4.3	Water															
4.3.1	Existing Regs	22,275	22,820	24,121	25,243	26,625	28,729	28,437	29,371	29,864	28,650	28,290	28,699	28,841	29,764	31,670
4.3.2	New Regs															
4.3.3	Full Implementation															
4.3.4	Total Water	22,275	22,820	24,121	25,243	26,625	28,729	28,437	29,371	29,864	28,650	28,290	28,699	28,841	29,764	31,670
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,256	12,961	12,539	13,677	14,255	15,369
5.1.2	New Regs															
5.1.3	Total Solid Waste	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,256	12,961	12,539	13,677	14,255	15,369
5.2	Hazardous Waste															
5.2.1	Existing Regs										182	147	741	941	1,325	1,360
5.2.2	New Regs															504
5.2.3	Total Hazardous Waste										182	147	741	941	1,325	1,864

(continued on next page)

Table 8-18 (cont'd): TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,438	13,108	13,280	14,619	15,581	16,729
5.4.2	New Regs															504
5.4.3	Total RCRA	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,438	13,108	13,280	14,619	15,581	17,233
5.5	Superfund															
5.5.1	Existing Regs															
5.5.2	New Regs										54	233	362	788	905	904
5.5.3	Total Superfund										54	233	362	788	905	904
5.6	Land															
5.6.1	Existing Regs	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,492	13,341	13,642	15,407	16,486	17,633
5.6.2	New Regs															504
5.6.3	Total Land	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,492	13,341	13,642	15,407	16,486	18,137
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs			9	5	9	49	201	415	441	367	352	243	343	404	491
6.1.2	New Regs															6
6.1.3	Total Toxic Subs			9	5	9	49	201	415	441	367	352	243	343	404	497
6.2	Pesticides															
6.2.1	Existing Regs	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.2.3	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Chemicals															
6.3.1	Existing Regs	92	143	183	181	349	410	625	923	901	791	749	616	783	873	910
6.3.2	New Regs															6
6.3.3	Total Chemicals	92	143	183	181	349	410	625	923	901	791	749	616	783	873	916
7	Multi-Media	108	139	461	591	745	958	909	917	918	785	646	727	712	709	897
8	Capital & O&M Costs															
8.3	Total Full Impl															
8.4	Total Capital & O&M	44,960	48,995	50,981	54,975	57,536	61,436	62,150	65,127	65,482	63,804	60,916	62,052	65,664	68,193	73,038
8.5	% of GNP	1.50	1.55	1.62	1.77	1.77	1.80	1.73	1.77	1.79	1.71	1.67	1.64	1.63	1.64	1.71

Footnotes to Table 8-18

9.1.1. Line 8.4 divided by Gross Domestic Product as given in "Economic Report of the President", February 1990, p. 304.

All other lines: Sum of corresponding lines in Tables 8-15 and 8-16.

Table 8-18A: TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	21,056	21,518	21,117	20,365	19,224	19,670	19,950	20,360	20,743	21,121	21,415	21,786	22,091	22,383	22,654
3.1.2	New Regs		477	590	743	389	690	818	804	966	2,257	3,463	4,342	5,346	6,012	7,160
3.1.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.1.4	Total Air	21,056	21,995	21,707	21,108	19,613	20,360	20,768	25,532	26,106	27,967	29,890	31,562	33,290	34,671	36,368
3.2	Radiation															
3.2.1	Existing Regs	361	337	353	388	420	447	473	501	529	557	585	613	641	668	696
3.2.2	New Regs	1	4	37	87	93	114	114	124	134	145	155	165	176	187	198
3.2.3	Total Radiation	362	341	390	475	513	560	588	625	664	702	740	778	817	855	894
3.3	Air & Radiation															
3.3.1	Existing Regs	21,417	21,855	21,470	20,753	19,643	20,117	20,424	20,861	21,272	21,678	22,000	22,399	22,731	23,052	23,350
3.3.2	New Regs	1	481	627	830	482	803	932	928	1,100	2,402	3,618	4,508	5,522	6,199	7,358
3.3.3	Full Implementation								4,368	4,398	4,589	5,012	5,434	5,854	6,276	6,554
3.3.4	Total Air & Radiation	21,418	22,337	22,097	21,583	20,125	20,920	21,356	26,157	26,770	28,669	30,630	32,340	34,107	35,527	37,262
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	28,774	30,217	28,202	28,481	28,977	29,415	29,384	29,395	29,438	29,511	30,018	30,526	31,033	31,540	32,047
4.1.2	New Regs			316	456	624	538	645	562	562	562	562	562	562	562	562
4.1.3	Full Implementation					1,933	2,180	2,867	3,613	4,369	5,137	5,468	5,796	6,122	6,445	6,766
4.1.4	Total Water Quality	28,774	30,217	28,518	28,937	31,533	32,133	32,896	33,569	34,369	35,210	36,048	36,884	37,717	38,548	39,375
4.2	Drinking Water															
4.2.1	Existing Regs	2,896	2,882	2,749	2,711	2,786	2,859	2,947	3,021	3,096	3,170	3,244	3,318	3,392	3,466	3,509
4.2.2	New Regs			125	251	259	698	1,384	1,755	2,072	2,568	2,740	2,348	1,781	1,485	1,485
4.2.3	Full Implementation															
4.2.4	Total Drinking Water	2,896	2,882	2,873	2,962	3,045	3,557	4,331	4,776	5,168	5,737	5,984	5,666	5,173	4,951	4,994
4.3	Water															
4.3.1	Existing Regs	31,670	33,098	30,951	31,192	31,763	32,274	32,331	32,416	32,533	32,681	33,262	33,844	34,425	35,007	35,556
4.3.2	New Regs			441	707	883	1,236	2,029	2,317	2,634	3,130	3,302	2,910	2,343	2,047	2,047
4.3.3	Full Implementation					1,933	2,180	2,867	3,613	4,369	5,137	5,468	5,796	6,122	6,445	6,766
4.3.4	Total Water	31,670	33,098	31,392	31,899	34,578	35,690	37,227	38,346	39,537	40,947	42,032	42,550	42,890	43,499	44,369
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	15,369	16,204	15,447	15,736	16,025	16,313	16,600	16,888	17,176	17,464	17,752	18,040	18,328	18,616	18,904
5.1.2	New Regs						2,301	2,880	1,774	1,895	1,895	1,393	1,393	1,393	1,393	1,393
5.1.3	Total Solid Waste	15,369	16,204	15,447	15,736	16,025	18,614	19,480	18,662	19,071	19,359	19,145	19,433	19,721	20,009	20,297
5.2	Hazardous Waste															
5.2.1	Existing Regs	1,360	1,684	1,869	2,967	3,403	4,023	6,113	6,487	6,959	6,786	6,810	7,005	7,200	7,395	7,589
5.2.2	New Regs	504	392	2,661	2,525	3,102	3,101	3,679	3,542	3,960	3,894	3,797	4,402	3,832	3,962	4,055
5.2.3	Total Hazardous Waste	1,864	2,076	4,530	5,492	6,505	7,124	9,792	10,029	10,919	10,680	10,607	11,407	11,032	11,357	11,644

(continued on next page)

Table 8-18A (cont'd): TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING FULL IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
5.3.2	New Regs				6,108	7,588	8,435	7,614	7,615	1,450	1,037	1,037	1,038	12,338	367	367
5.3.3	Total LUST		1	13	6,138	7,618	8,476	7,666	7,677	1,522	1,118	1,128	1,139	12,449	487	497
5.4	RCRA															
5.4.1	Existing Regs	16,729	17,889	17,329	18,732	19,458	20,377	22,766	23,437	24,207	24,331	24,654	25,146	25,639	26,131	26,624
5.4.2	New Regs	504	392	2,661	8,633	10,690	13,837	14,173	12,931	7,305	6,826	6,227	6,833	17,563	5,722	5,815
5.4.3	Total RCRA	17,233	18,281	19,990	27,365	30,148	34,214	36,939	36,368	31,512	31,157	30,881	31,979	43,202	31,853	32,439
5.5	Superfund															
5.5.1	Existing Regs	904	1,815	2,345	3,422	3,622	4,467	6,092	6,876	7,383	7,843	8,023	8,397	8,784	9,164	9,565
5.5.2	New Regs															
5.5.3	Total Superfund	904	1,815	2,345	3,422	3,622	4,467	6,092	6,876	7,383	7,843	8,023	8,397	8,784	9,164	9,565
5.6	Land															
5.6.1	Existing Regs	17,633	19,704	19,674	22,154	23,080	24,844	28,858	30,313	31,590	32,174	32,677	33,543	34,423	35,295	36,189
5.6.2	New Regs	504	392	2,661	8,633	10,690	13,837	14,173	12,931	7,305	6,826	6,227	6,833	17,563	5,722	5,815
5.6.3	Total Land	18,137	20,096	22,335	30,787	33,770	38,681	43,031	43,244	38,895	39,000	38,904	40,376	51,986	41,017	42,004
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	491	439	436	428	399	447	457	468	387	399	410	421	432	444	455
6.1.2	New Regs	6		80	914	898	962	1,025	305	307	308	349	352	355	358	361
6.1.3	Total Toxic Subs	497	439	516	1,342	1,297	1,409	1,482	773	694	707	759	773	787	802	816
6.2	Pesticides															
6.2.1	Existing Regs	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.2.3	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Chemicals															
6.3.1	Existing Regs	910	892	890	1,124	1,378	1,532	1,627	1,725	1,692	1,752	1,816	1,886	1,948	2,025	2,113
6.3.2	New Regs	6		80	914	898	962	1,025	305	307	308	349	352	355	358	361
6.3.3	Total Chemicals	916	892	970	2,038	2,276	2,494	2,652	2,030	1,999	2,060	2,165	2,238	2,303	2,383	2,474
7	Multi-Media	897	815	2,828	1,591	2,705	1,568	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883
8	Capital & O&M Costs															
8.1	Total Existing Regs	72,527	76,365	75,813	76,814	78,569	80,336	84,796	86,910	88,719	89,954	91,463	93,423	95,323	97,218	99,091
8.2	Total New Regs	511	873	3,808	11,084	12,953	16,838	18,160	16,481	11,346	12,666	13,496	14,602	25,783	14,326	15,580
8.3	Total Full Impl					1,933	2,180	2,867	7,981	8,767	9,726	10,480	11,230	11,976	12,721	13,320
8.4	Total Capital & O&M	73,038	77,238	79,621	87,899	93,454	99,354	105,822	111,371	108,832	112,346	115,439	119,256	133,082	124,265	127,992
8.5	% of GNP	1.71	1.74	1.72	1.84	2.00	2.08	2.17	2.24	2.14	2.17	2.19	2.22	2.43	2.23	2.26

Footnotes to Table 8-18A

Sum of the corresponding lines in Tables 8-15A and 8-16A.

Table 8-19: TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	12,814	15,720	15,349	17,945	18,407	19,044	19,348	20,047	19,410	18,819	17,666	18,152	19,705	20,110	21,056
3.1.2	New Regs															
3.1.3	Total Air	12,814	15,720	15,349	17,945	18,407	19,044	19,348	20,047	19,410	18,819	17,666	18,152	19,705	20,110	21,056
3.2	Radiation															
3.2.1	Existing Regs	18	17	277	248	169	176	254	244	268	267	225	216	216	252	361
3.2.2	New Regs															1
3.2.3	Total Radiation	18	17	277	248	169	176	254	244	268	267	225	216	216	252	362
3.3	Air & Radiation															
3.3.1	Existing Regs	12,832	15,737	15,627	18,193	18,576	19,220	19,602	20,291	19,678	19,085	17,891	18,368	19,921	20,362	21,417
3.3.2	New Regs															1
3.3.3	Total Air & Radiation	12,832	15,737	15,627	18,193	18,576	19,220	19,602	20,291	19,678	19,085	17,891	18,368	19,921	20,362	21,418
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	20,806	21,308	22,479	23,502	24,831	26,935	26,539	27,211	27,545	26,236	25,858	26,321	26,455	27,142	28,774
4.1.2	New Regs															
4.1.3	Total Water Quality	20,806	21,308	22,479	23,502	24,831	26,935	26,539	27,211	27,545	26,236	25,858	26,321	26,455	27,142	28,774
4.2	Drinking Water															
4.2.1	Existing Regs	1,468	1,512	1,641	1,741	1,794	1,793	1,898	2,160	2,319	2,413	2,433	2,378	2,386	2,622	2,896
4.2.2	New Regs															
4.2.3	Total Drinking Water	1,468	1,512	1,641	1,741	1,794	1,793	1,898	2,160	2,319	2,413	2,433	2,378	2,386	2,622	2,896
4.3	Water															
4.3.1	Existing Regs	22,275	22,820	24,121	25,243	26,625	28,729	28,437	29,371	29,864	28,650	28,290	28,699	28,841	29,764	31,670
4.3.2	New Regs															
4.3.3	Total Water	22,275	22,820	24,121	25,243	26,625	28,729	28,437	29,371	29,864	28,650	28,290	28,699	28,841	29,764	31,670
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,256	12,961	12,539	13,677	14,255	15,369
5.1.2	New Regs															
5.1.3	Total Solid Waste	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,256	12,961	12,539	13,677	14,255	15,369
5.2	Hazardous Waste															
5.2.1	Existing Regs										182	147	741	941	1,325	1,360
5.2.2	New Regs															504
5.2.3	Total Hazardous Waste										182	147	741	941	1,325	1,864

(continued on next page)

Table 8-19 (cont'd): TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
5.3	LUST															
5.3.1	Existing Regs															
5.3.2	New Regs															
5.3.3	Total LUST															
5.4	RCRA															
5.4.1	Existing Regs	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,438	13,108	13,280	14,619	15,581	16,729
5.4.2	New Regs															504
5.4.3	Total RCRA	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,438	13,108	13,280	14,619	15,581	17,233
5.5	Superfund															
5.5.1	Existing Regs										54	233	362	788	905	904
5.5.2	New Regs															
5.5.3	Total Superfund										54	233	362	788	905	904
5.6	Land															
5.6.1	Existing Regs	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,492	13,341	13,642	15,407	16,486	17,633
5.6.2	New Regs															504
5.6.3	Total Land	9,654	10,157	10,590	10,767	11,240	12,119	12,576	13,625	14,120	14,492	13,341	13,642	15,407	16,486	18,137
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs			9	5	9	49	201	415	441	367	352	243	343	404	491
6.1.2	New Regs															6
6.1.3	Total Toxic Subs			9	5	9	49	201	415	441	367	352	243	343	404	497
6.2	Pesticides															
6.2.1	Existing Regs	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.2.2	Total Pesticides	92	143	175	176	340	361	424	508	461	424	397	374	440	470	420
6.3	Chemicals															
6.3.1	Existing Regs	92	143	183	181	349	410	625	923	901	791	749	616	783	873	910
6.3.2	New Regs															6
6.3.3	Total Chemicals	92	143	183	181	349	410	625	923	901	791	749	616	783	873	916
7	Multi-Media	108	139	461	591	745	958	909	917	918	785	646	727	712	709	897
8	Capital & O&M Costs															
8.3	Total Capital & O&M	44,960	48,995	50,981	54,975	57,536	61,436	62,150	65,127	65,482	63,804	60,916	62,052	65,664	68,193	73,038
8.4	% of GNP	1.50	1.55	1.62	1.77	1.77	1.80	1.73	1.77	1.79	1.71	1.67	1.64	1.63	1.64	1.71

Footnotes to Table 8-19

Lines correspond with Table 8-18 except full implementation lines have been omitted.

Table 8-19A: TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3	Air and Radiation															
3.1	Air															
3.1.1	Existing Regs	21,056	21,518	21,117	20,365	19,224	19,670	19,950	20,360	20,743	21,121	21,415	21,786	22,091	22,383	22,654
3.1.2	New Regs		477	590	743	389	690	818	804	966	2,257	3,463	4,342	5,346	6,012	7,160
3.1.3	Total Air	21,056	21,995	21,707	21,108	19,613	20,360	20,768	21,164	21,708	23,378	24,878	26,128	27,436	28,395	29,814
3.2	Radiation															
3.2.1	Existing Regs	361	337	353	388	420	447	473	501	529	557	585	613	641	668	696
3.2.2	New Regs	1	4	37	87	93	114	114	124	134	145	155	165	176	187	198
3.2.3	Total Radiation	362	341	390	475	513	560	588	625	664	702	740	778	817	855	894
3.3	Air & Radiation															
3.3.1	Existing Regs	21,417	21,855	21,470	20,753	19,643	20,117	20,424	20,861	21,272	21,678	22,000	22,399	22,731	23,052	23,350
3.3.2	New Regs	1	481	627	830	482	803	932	928	1,100	2,402	3,618	4,508	5,522	6,199	7,358
3.3.3	Total Air & Radiation	21,418	22,337	22,097	21,583	20,125	20,920	21,356	21,789	22,372	24,080	25,618	26,906	28,253	29,251	30,708
4	Water															
4.1	Water Quality															
4.1.1	Existing Regs	28,774	30,217	28,202	28,481	28,977	29,415	29,384	29,395	29,438	29,511	30,018	30,526	31,033	31,540	32,047
4.1.2	New Regs			316	456	624	538	645	562	562	562	562	562	562	562	562
4.1.3	Total Water Quality	28,774	30,217	28,518	28,937	29,601	29,953	30,029	29,957	30,000	30,073	30,580	31,088	31,595	32,102	32,609
4.2	Drinking Water															
4.2.1	Existing Regs	2,896	2,882	2,749	2,711	2,786	2,859	2,947	3,021	3,096	3,170	3,244	3,318	3,392	3,466	3,509
4.2.2	New Regs			125	251	259	698	1,384	1,755	2,072	2,568	2,740	2,348	1,781	1,485	1,485
4.2.3	Total Drinking Water	2,896	2,882	2,873	2,962	3,045	3,557	4,331	4,776	5,168	5,737	5,984	5,666	5,173	4,951	4,994
4.3	Water															
4.3.1	Existing Regs	31,670	33,098	30,951	31,192	31,763	32,274	32,331	32,416	32,533	32,681	33,262	33,844	34,425	35,007	35,556
4.3.2	New Regs			441	707	883	1,236	2,029	2,317	2,634	3,130	3,302	2,910	2,343	2,047	2,047
4.3.3	Total Water	31,670	33,098	31,392	31,899	32,646	33,510	34,360	34,733	35,168	35,810	36,564	36,753	36,768	37,053	37,603
5	Land															
5.1	Solid Waste															
5.1.1	Existing Regs	15,369	16,204	15,447	15,736	16,025	16,313	16,600	16,888	17,176	17,464	17,752	18,040	18,328	18,616	18,904
5.1.2	New Regs						2,301	2,880	1,774	1,895	1,895	1,393	1,393	1,393	1,393	1,393
5.1.3	Total Solid Waste	15,369	16,204	15,447	15,736	16,025	18,614	19,480	18,662	19,071	19,359	19,145	19,433	19,721	20,009	20,297
5.2	Hazardous Waste															
5.2.1	Existing Regs	1,360	1,684	1,869	2,967	3,403	4,023	6,113	6,487	6,959	6,786	6,810	7,005	7,200	7,395	7,589
5.2.2	New Regs	504	392	2,661	2,525	3,102	3,101	3,679	3,542	3,960	3,894	3,797	4,402	3,832	3,962	4,055
5.2.3	Total Hazardous Waste	1,864	2,076	4,530	5,492	6,505	7,124	9,792	10,029	10,919	10,680	10,607	11,407	11,032	11,357	11,644

(continued on next page)

Table 8-19A (cont'd): TOTAL CAPITAL PLUS OPERATING EXPENDITURES ASSUMING PRESENT IMPLEMENTATION

(millions of 1986 dollars)

Rpt Sec	Media	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.3	LUST															
5.3.1	Existing Regs		1	13	30	30	41	52	62	72	81	91	101	111	120	130
5.3.2	New Regs				6,108	7,588	8,435	7,614	7,615	1,450	1,037	1,037	1,038	12,338	367	367
5.3.3	Total LUST		1	13	6,138	7,618	8,476	7,666	7,677	1,522	1,118	1,128	1,139	12,449	487	497
5.4	RCRA															
5.4.1	Existing Regs	16,729	17,889	17,329	18,732	19,458	20,377	22,766	23,437	24,207	24,331	24,654	25,146	25,639	26,131	26,624
5.4.2	New Regs	504	392	2,661	8,633	10,690	13,837	14,173	12,931	7,305	6,826	6,227	6,833	17,563	5,722	5,815
5.4.3	Total RCRA	17,233	18,281	19,990	27,365	30,148	34,214	36,939	36,368	31,512	31,157	30,881	31,979	43,202	31,853	32,439
5.5	Superfund															
5.5.1	Existing Regs	904	1,815	2,345	3,422	3,622	4,467	6,092	6,876	7,383	7,843	8,023	8,397	8,784	9,164	9,565
5.5.2	New Regs															
5.5.3	Total Superfund	904	1,815	2,345	3,422	3,622	4,467	6,092	6,876	7,383	7,843	8,023	8,397	8,784	9,164	9,565
5.6	Land															
5.6.1	Existing Regs	17,633	19,704	19,674	22,154	23,080	24,844	28,858	30,313	31,590	32,174	32,677	33,543	34,423	35,295	36,189
5.6.2	New Regs	504	392	2,661	8,633	10,690	13,837	14,173	12,931	7,305	6,826	6,227	6,833	17,563	5,722	5,815
5.6.3	Total Land	18,137	20,096	22,335	30,787	33,770	38,681	43,031	43,244	38,895	39,000	38,904	40,376	51,986	41,017	42,004
6	Chemicals															
6.1	Toxic Substances															
6.1.1	Existing Regs	491	439	436	428	399	447	457	468	387	399	410	421	432	444	455
6.1.2	New Regs	6		80	914	898	962	1,025	305	307	308	349	352	355	358	361
6.1.3	Total Toxic Subs	497	439	516	1,342	1,297	1,409	1,482	773	694	707	759	773	787	802	816
6.2	Pesticides															
6.2.1	Existing Regs	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.2.2	Total Pesticides	420	453	454	697	979	1,085	1,170	1,257	1,305	1,353	1,407	1,465	1,516	1,582	1,658
6.3	Chemicals															
6.3.1	Existing Regs	910	892	890	1,124	1,378	1,532	1,627	1,725	1,692	1,752	1,816	1,886	1,948	2,025	2,113
6.3.2	New Regs	6		80	914	898	962	1,025	305	307	308	349	352	355	358	361
6.3.3	Total Chemicals	916	892	970	2,038	2,276	2,494	2,652	2,030	1,999	2,060	2,165	2,238	2,303	2,383	2,474
7	Multi-Media	897	815	2,828	1,591	2,705	1,568	1,557	1,594	1,632	1,670	1,708	1,751	1,795	1,839	1,883
8	Capital & O&M Costs															
8.1	Total Existing Regs	72,527	76,365	75,813	76,814	78,569	80,336	84,796	86,910	88,719	89,954	91,463	93,423	95,323	97,218	99,091
8.2	Total New Regs	511	873	3,808	11,084	12,953	16,838	18,160	16,481	11,346	12,666	13,496	14,602	25,783	14,326	15,580
8.3	Total Capital & O&M	73,038	77,238	79,621	87,899	91,522	97,174	102,956	103,391	100,065	102,620	104,959	108,026	121,106	111,544	114,672
8.4	% of GNP	1.71	1.74	1.72	1.84	1.95	2.03	2.11	2.08	1.97	1.98	1.99	2.01	2.21	2.00	2.02

Footnotes to Table 8-19A

Lines correspond with Table 8-18A except full implementation lines have been omitted.

9. ANALYSIS AND CONCLUSIONS

The cost estimates presented in this report, together with data from other recent EPA studies, permit some interesting comparisons of pollution control costs. These lead to preliminary conclusions that may be of interest to Congress when considering the economic aspects of future environmental legislation. This chapter discusses five such cost comparisons, and some general conclusions that follow from these.

9.1. COST COMPARISONS

Below, comparisons of costs over time are discussed for the following categories of pollution control costs and expenditures:

9.1.1. Total expenditures as a percentage of Gross National Product;
9.1.2. International pollution control expenditures;
9.1.3. Environmental media expenditure shares;
9.1.4. Cost burdens on local governments; and
9.1.5. Long term trends in total costs.

9.1.1. Total Expenditures as a Percentage of Gross National Product

In Chapter 8, measures of total annualized pollution control costs as a percentage of Gross National Product (GNP) were used to provide a national economic perspective for the costs of environmental protection. Another way to examine the relationship between pollution control costs and national income aggregates is to compare annual measures of total pollution control expenditures—the sum of capital and operating outlays—as a percentage of GNP.

The total expenditures measure differs from the total annualized costs measure discussed throughout the previous chapters. Annualized costs reflect the sum of operating costs and total amortized capital costs, which represents depreciation and interest charges on the stock of capital in use as of that year. The total expenditures measure, on the other hand, represents total operating cost plus the total value of capital equipment purchased in that year alone. It thus includes total monetary outlays in a particular year, and excludes depreciation and interest charges on past capital investments. The measure of total expenditures as a percentage of GNP is useful because it uses the pollution control cost aggregate that is most similar to the GNP measure.

Tables 8-18 and 8-19 show total pollution control expenditures as a percentage of GNP under both present and full implementation scenarios over the period 1972-2000.[1] As illustrated in Figure 9-1, expenditures as a percentage of GNP increased from about 1.5 percent in the early

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[1] In order to compute total pollution control expenditures as a percentage of GNP for future years, data on GNP over the period 1972-1989 (in constant 1986 dollars) were linearly extrapolated to years 1990-2000.

1970s to roughly 1.8 percent in the mid- and late 1970s, but fell slightly to about 1.7 percent during the 1980s. Expenditures as a percentage of GNP are projected to increase gradually over the 1990s, reaching an estimated 2.2 percent by the year 2000 under the full implementation scenario. Under the present implementation scenario, expenditures are expected to level off at about two percent in the late 1990s.

Figure 9-2 shows the break down of total expenditures by type of regulation for the years 1986-2000. In the early part of the period, new regulations make up most of the increase above that resulting from existing regulations; in the late 1990s, the added costs are more evenly split between new regulations and full implementation.

Another comparison that can be made using the total expenditures data is how environmental pollution control expenditures compare with other national expenditures familiar to the individual citizen. These comparisons can be made in terms of percentages of Gross National Product (GNP) as follows:

COMPARATIVE U.S. EXPENDITURES AS PERCENT OF GNP	1980	1987
Environmental Pollution Control[1]	1.8	1.7
Clothing and Shoes[2]	3.6	4.2
National Defense[2]	5.4	6.9
Medical Care[2]	6.3	7.0
Housing[2]	9.8	9.3
Food[2]	12.4	11.7

[1] From Table 8-19. Assumes full implementation.
[2] From *Economic Report of the President*, January 1989, Tables B-2 and B-11.

As can be seen, environmental pollution control represents a small fraction of the expenditures on many of the major components of GNP.

9.1.2. International Pollution Control Expenditures

Comparable estimates of pollution control costs in other developed countries are available for certain Western European nations only as a result of data collected by the Organization for Economic Cooperation and Development.[2] They largely used a total non-household expenditures measure of costs and the Gross Domestic Product (GDP) measure of national income to make the estimates comparable between countries. The nature of the total expenditures measure of costs is discussed in the previous section. In order to make the expenditure estimates presented in this Report comparable to these OECD estimates, U.S. non-household expenditures are derived by subtracting out household pollution control expenditures from total U.S. pollution control expenditure estimates presented in Table 8-18. The U.S. non-household pollution control expenditure estimates are presented and explained in Table 9-1. Table 9-2 uses this data to compare the sum of non-household capital and operating expenditures as a percentage of GDP for the United States and these Western European countries over the years 1972-1986. Data including household expenditures are also presented for the United States and France, the only countries for which such data are available. The data for 1985, the most recent year for which data are available for all the countries listed in Table 9-2, are shown graphically in Figure 9-3.

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[2] These cost estimates are reported in: Organization for Economic Cooperation and Development, *Pollution Control and Abatement Expenditure in OECD Countries: A Statistical Compendium*, OECD Environment Monographs, No. 38, November 1990, p. 40.

International cost comparisons indicate that in almost every year for which there is comparable data, non-household pollution expenditures as a percentage of GDP were higher in the U.S. than in most of the nations for which comparable data are available. In 1985, the most recent year for which data are available for every country listed in Table 9-2, the percentage of non-household expenditures in the U.S. were nine to 76 percent higher than expenditures in Finland, the Netherlands, the United Kingdom, France, and Norway, and five percent less than in West Germany.[3]

9.1.3. Environmental Media Expenditure Shares

A third useful comparison involves the shares of total U.S. expenditures accounted for by different environmental media over time. The sum of capital and operating expenditures is used for these comparisons since this measure of costs does not include interest and depreciation costs on past capital investments, and thus illustrates near-term future trends more clearly than annualized costs. As in the previous section, this measure is referred to as total expenditures to distinguish it from annualized costs.

Figure 9-4 shows total expenditures by environmental medium over the period 1986 to 2000. Figure 9-5 shows the percentage of total expenditures accounted for by each environmental medium in 1997 compared to 1987. Both figures assume full implementation. The figures show that chemical control expenditures are expected to grow in the future at the most rapid rate for any environmental medium. However, chemical costs are relatively insignificant, and are expected to account for less than two percent of total expenditures in the year 1997. The most significant increase in total expenditures is expected in the land medium. Land expenditures are estimated to increase from 26 percent of total expenditures in 1987 to 34 percent by the year 1997. The share of water expenditures over these years is expected to fall from 43 percent of total expenditures in 1987 to 34 percent in 1997, while the share of air expenditures is expected to fall slightly from 29 percent to 27 percent. Since these estimates are based on full implementation, the share of water expenditures may fall even more if the full implementation assumptions with regard to meeting municipal wastewater treatment needs are not fulfilled.

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[3] It should be noted that the differences in the estimates for the United States and West Germany are small enough that they could be the result of inaccuracies in the data or the methods used to put them in comparable terms.

The components of future land expenditures are shown graphically in Figures 9-6 through 9-11. Figure 9-6 shows that total expenditures for existing land programs are projected to increase further over the period 1987-2000. The increase in land expenditures associated with new and forthcoming regulations follow a less regular trend. Expenditures for new regulations are expected to increase rapidly over the period 1987-1992. By 1992, new regulations will account for an estimated 34 percent of total land expenditures. Expenditures for new regulations are expected to fall off considerably over the next few years to roughly one-half the 1992 level. However, they are expected to jump again in 1998 and then fall back to the mid-1990 trend over years 1999-2000. Figure 9-7 shows that the two jumps in new regulation expenditures are due largely to those associated with new rules for underground storage tanks (UST). The first jump is due in part to large UST corrective action expenditures; the second jump is due primarily to large capital expenditures for the upgrade/replacement of tanks in 1998, the regulatory deadline for such action. The UST expenditures are broken out separately in Figure 9-10.

Solid waste is expected to account for the largest share of land expenditures over the period 1987-2000, followed by hazardous waste, Superfund, and UST. This is shown in Figure 9-7. The large majority of solid waste expenditures are for local government and private sector trash collection and disposal activities, however, most of which do not result from Federal laws and regulations. As shown in Figure 9-8, Federal solid waste regulations are expected to account for only 15 percent of total solid waste expenditures in 1992, decreasing to about ten percent in subsequent years.

Figure 9-9 breaks out hazardous waste expenditures by existing and new regulations, and also shows that portion of existing regulation expenditures expected to be incurred by the U.S. Department of Energy (DOE) and the U.S. Department of Defense (DOD). This figure shows that existing regulations will account for an average of 64 percent of total hazardous waste expenditures over the period 1992-2000. An average of approximately 52 percent of these expenditures will be incurred by DOE and DOD over the period.

Superfund expenditures are also estimated to increase rapidly over the period 1987-2000, and DOE and DOD together are expected to account for an average of about 35 percent of the total over the period. Figure 9-11 shows total Superfund expenditures and that portion of the total expected to be incurred by DOE and DOD.

9.1.4. Cost Burdens on Local Governments

A fourth interesting comparison involves local government pollution control costs over time. The estimates presented in Chapter 8 suggest that although the percentage share of costs funded by local government is not projected to change much, total annualized costs to local governments will increase substantially over the period 1987-2000. As shown in Table 8-12A, annualized costs under the present implementation scenario are expected to increase from $19 billion in 1987 to over $32 billion by the year 2000, a 69 percent increase. Increases in local government costs are driven primarily by expenditures for wastewater treatment and by revisions to several environmental laws in recent years that establish broader and more stringent standards for drinking water treatment, sewage sludge disposal, and solid waste disposal.

A more detailed examination of the economic impacts of environmental pollution control regulations at the local level can be found in the *Municipal Sector Study*[4] released by EPA in 1988. This report was part of a larger study that summarized the economic impacts of expanding pollution control requirements on municipalities, small business, and agriculture.[5]

The study found that new and forthcoming pollution controls on local governments will require significant additional capital investments and increases in rates charged to customers for expanded environmental services. It is estimated that in the coming years the average household will be charged an additional $100 annually for locally-provided environmental services. Those municipalities with populations under 2,500 and over 250,000 will experience the greatest increases in total user costs on a per household basis, with average additions to annual user charges and fees of $170 and $160, respectively (see Table 9-3). When these costs are added to projected increases in costs necessary to maintain current services, average household costs in the year 2000 are estimated to be 60 to 120 percent higher than 1986 costs. Municipalities with populations under 2500 are expected to experience costs in the upper end of this range. Because smaller municipalities tend to have lower average household incomes and higher unit costs for improved environmental services, households in smaller communities will be required to pay a greater proportion of their incomes on average than households in larger cities for comparable environmental services. Households in communities with populations under 2,500 will pay an average 0.7 percent of their incomes for environmental services while those in larger cities will pay, on average, 0.5 percent.

Most municipalities are expected to be able to meet the estimated increases in environmental expenses and still remain financially sound. The municipalities most likely to experience difficulties will be those with populations of 2,500 or less. Between 21 percent and 30 percent of these communities may experience difficulties because of the high costs of certain individual regulations, the cumulative costs of recent legislative requirements, and the limited margin for expanding financial obligations in small communities. Such difficulties are not limited to small cities, but it is estimated that a much smaller proportion (between three and seven percent) of cities with populations over 2,500 persons will face financial problems as a result of EPA requirements.

The individual environmental regulations that account for the largest potential cost increases to small municipalities are sewage treatment and new drinking water treatment requirements. Several of the more costly drinking water regulations will apply to a greater proportion of smaller municipalities than larger municipalities since they deal with environmental risks that are more often found in smaller community water systems. Many larger water supply systems already have introduced treatment systems to control such risks. The costs of solid waste disposal, asbestos removal in schools, and underground storage tank regulations, also account for a significant portion of the additional costs expected to be borne by smaller communities.

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[4] U.S. EPA, *The Municipal Sector Study: Impacts of Environmental Regulation on Municipalities*, Report No. 230-09-88-038, September 1988.

[5] U.S. EPA, *Municipalities, Small Business, and Agriculture: The Challenge of Meeting Environmental Responsibilities*, Report No. 230-88-037, September 1988.

9.1.5. Long Term Trends in Total Costs

A comparison of total annualized costs over the period 1972-2000 (see Figures 8-2 to 8-4) shows that pollution control costs in constant dollars and as a percentage of GNP have increased steadily over time, but at a decreasing rate of increase, and are expected to do so through the year 2000. In the year 2000, costs are expected to be more than 70 percent higher than year 1987 levels under the present implementation scenario, which includes costs for all current and planned pollution control programs. Year 2000 costs are estimated to be over 85 percent higher than 1987 levels under the full implementation scenario, which includes the costs of achieving the ozone NAAQS nationwide and the expenditures needed to fulfill the nation's wastewater treatments needs, in addition to costs for all current and planned programs. Since the ozone standard is more likely to be implemented, given the enactment of the Clean Air Amendments of 1990, than the wastewater treatment needs are to be met, the most likely projected costs would seem to be between the present and full implementation projections. On the other hand, as discussed in Section 3.1.3, the cost estimates for the Clean Air Act Amendments appear likely to be higher than those used in this report. A case can therefore be made that the costs may lie nearer the full than the present cost projections.

Beyond the year 2000, the difficulty of projecting costs becomes even greater. The Clean Air Act Amendments envision increasing costs beyond the year 2000. The annual costs for the Administration's Clean Air proposal included in this report are estimated to be $4 to $7 billion higher by the year 2005 compared to 2000. The trend also points upward, but at a decelerating rate of increase. All of this suggests continued cost increases beyond the year 2000, at least until 2005.

9.2. CONCLUSIONS

The comparisons of pollution control costs discussed above and in Chapter 8 lead to a number of conclusions. First, national expenditures on pollution control as a percentage of GDP have been somewhat higher in the U.S. than in most Western European nations for which comparable data are available. While these results are not conclusive evidence, they do suggest that the United States' commitment to national pollution control is at least as great as that of many of its economic peers.

Second, over the next decade there is expected to be a shift in the relative shares of total environmental control costs accounted for by different environmental media. Most significantly, there is expected to be a substantial increase in the share of total costs directed towards land pollution control (which includes a significant groundwater protection component), and a corresponding decrease in the share of total costs directed towards the control of surface water quality. This is due largely to legislation enacted in the 1980s relating to past and current hazardous waste management practices. Costs associated with the Superfund clean-up of abandoned hazardous waste sites and various RCRA programs involving current hazardous waste operations, including the corrective action and underground storage tank programs, are expected to impose significantly increasing costs over the next decade.

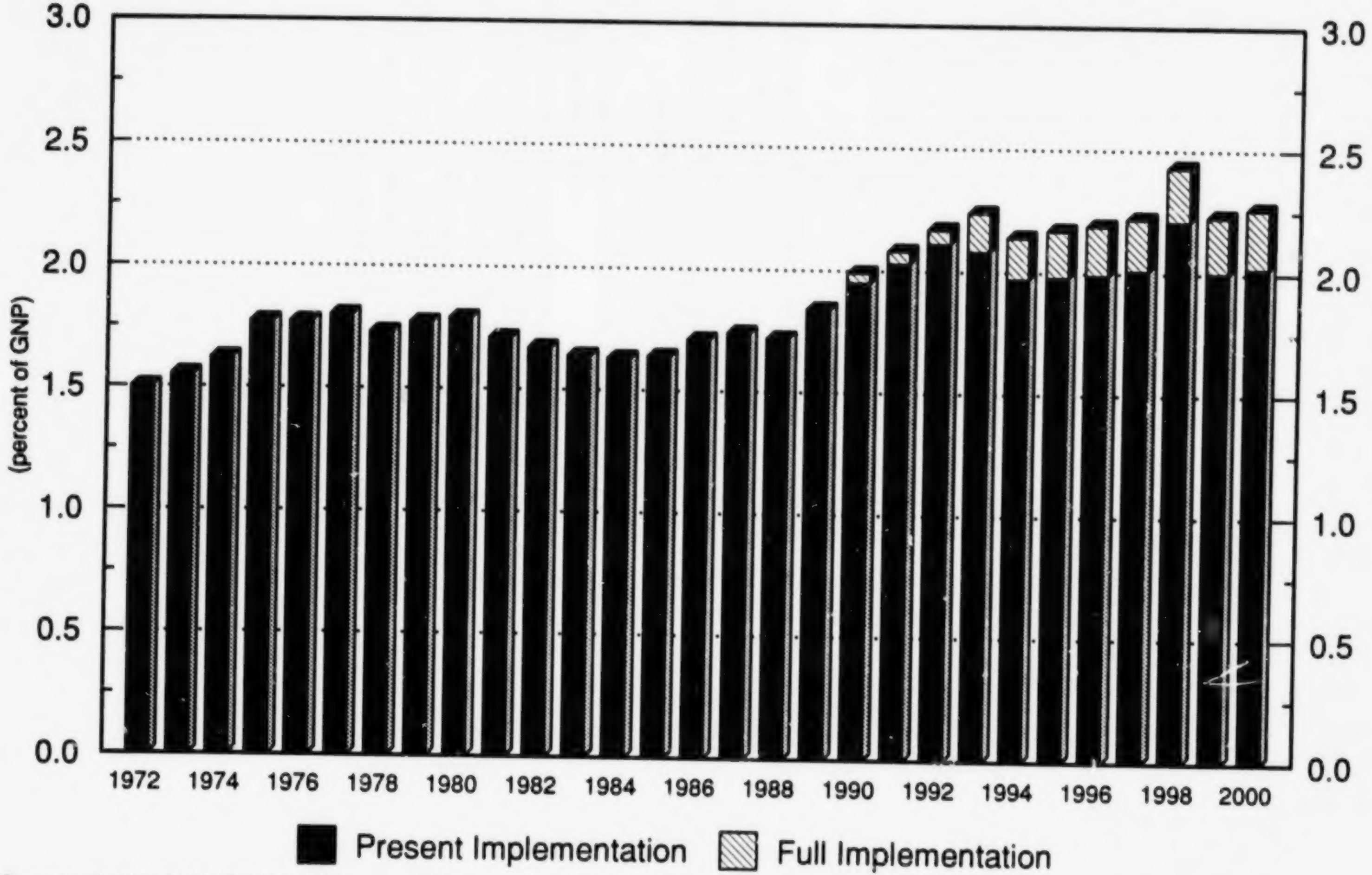
Third, although their percentage share of total pollution control expenditures is expected to fall slightly, it is projected that over the next several years pollution control burdens on municipalities will increase dramatically, and result in large increases in the fees charged to consumers for locally-provided environmental services. Moreover, many smaller municipalities may face severe difficulties in securing the capital resources necessary to comply with pollution control requirements. The EPA is currently extending technical and financial assistance to alleviate these constraints. The EPA, municipalities, and private entities are also exploring more innovative ways to mitigate pollution control burdens on localities. These include public partnerships and regionalization projects, whereby two or more communities may share expertise, jointly purchase environmental services in volume at discount prices, and enter into joint ventures for financing pollution control infrastructure.

Fourth, although increasing, national environmental pollution control expenditures remain less than half those for clothing and shoes, one-third those for national defense, one-third those for medical care, one-fifth those for housing, and one-sixth those for food.

Fifth, as discussed in Section 8.1.4, the non-EPA federal share of total annualized pollution costs is projected to increase by more than 140 percent between 1987 and 2000, primarily as a result of the cost of military and nuclear waste clean-up. All other shares, particularly the private sector, are expected to fall somewhat. Even though the EPA share is expected to fall, the net effect is that the federal share is projected to increase over this period.

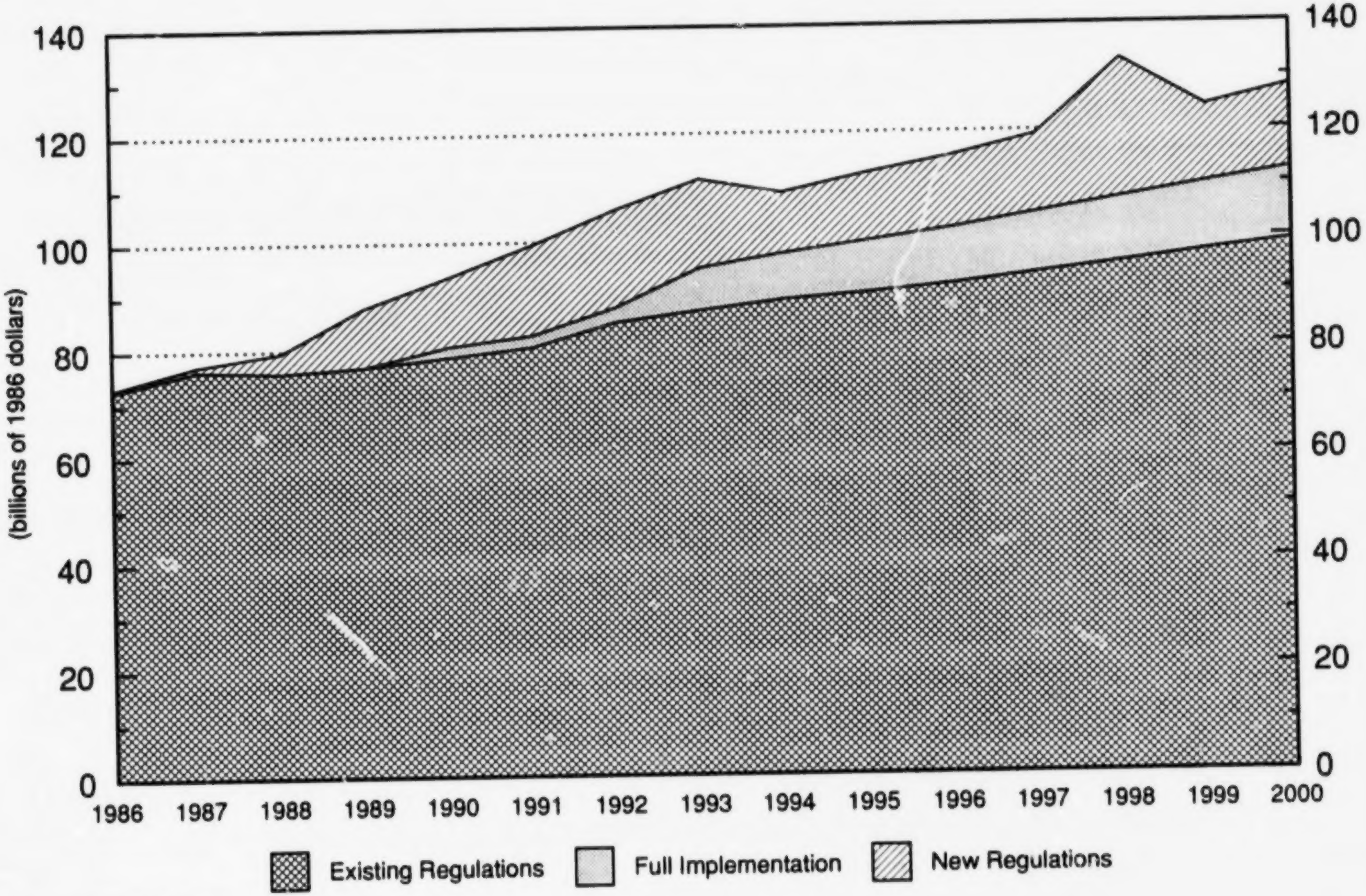
Finally, the estimates presented in this Report show that total annualized costs for pollution control programs have been increasing fairly rapidly in recent years, and are expected to continue this trend through the year 2000. Currently, the nation spends about two percent of GNP on pollution control; this is expected to increase to between 2.6 and 2.8 percent of GNP by the year 2000. There is reason to believe that pollution control costs will be rising significantly at least through the year 2005. Even if no new environmental legislation is passed beyond the Clean Air Act Amendments of 1990, pollution control costs appear likely to continue to increase beyond the costs projected in this report for the year 2000. Moreover, if new environmental legislation should be enacted in the future, costs would be higher than those projected in this report.

Fig. 9-1: U.S. POLLUTION CONTROL EXPENDITURES AS A PERCENTAGE OF GNP



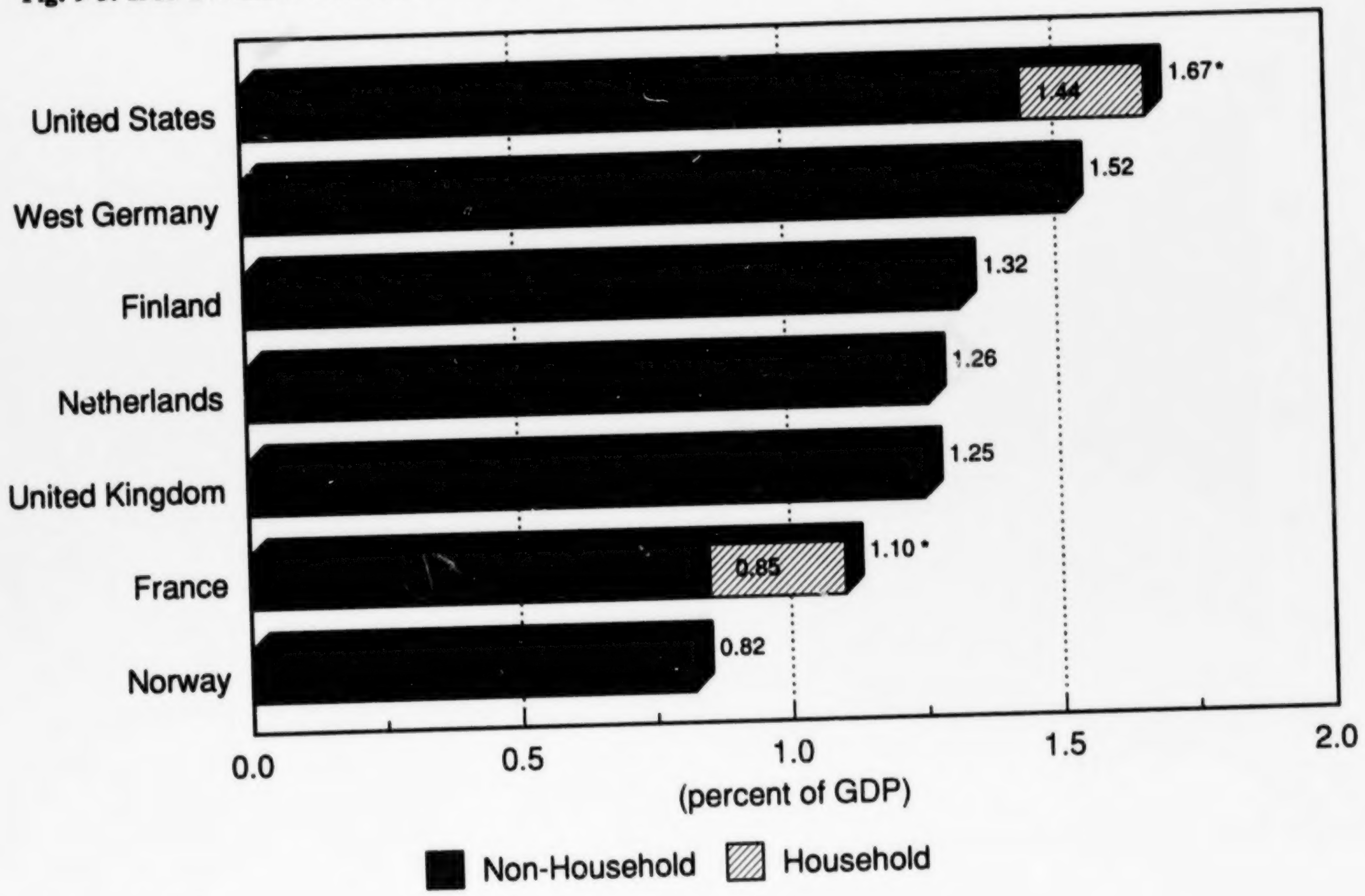
Source: Tables 8-18, 8-18A, 8-19, and 8-19A

Fig. 9-2: TOTAL CAPITAL AND OPERATING EXPENDITURES BY TYPE



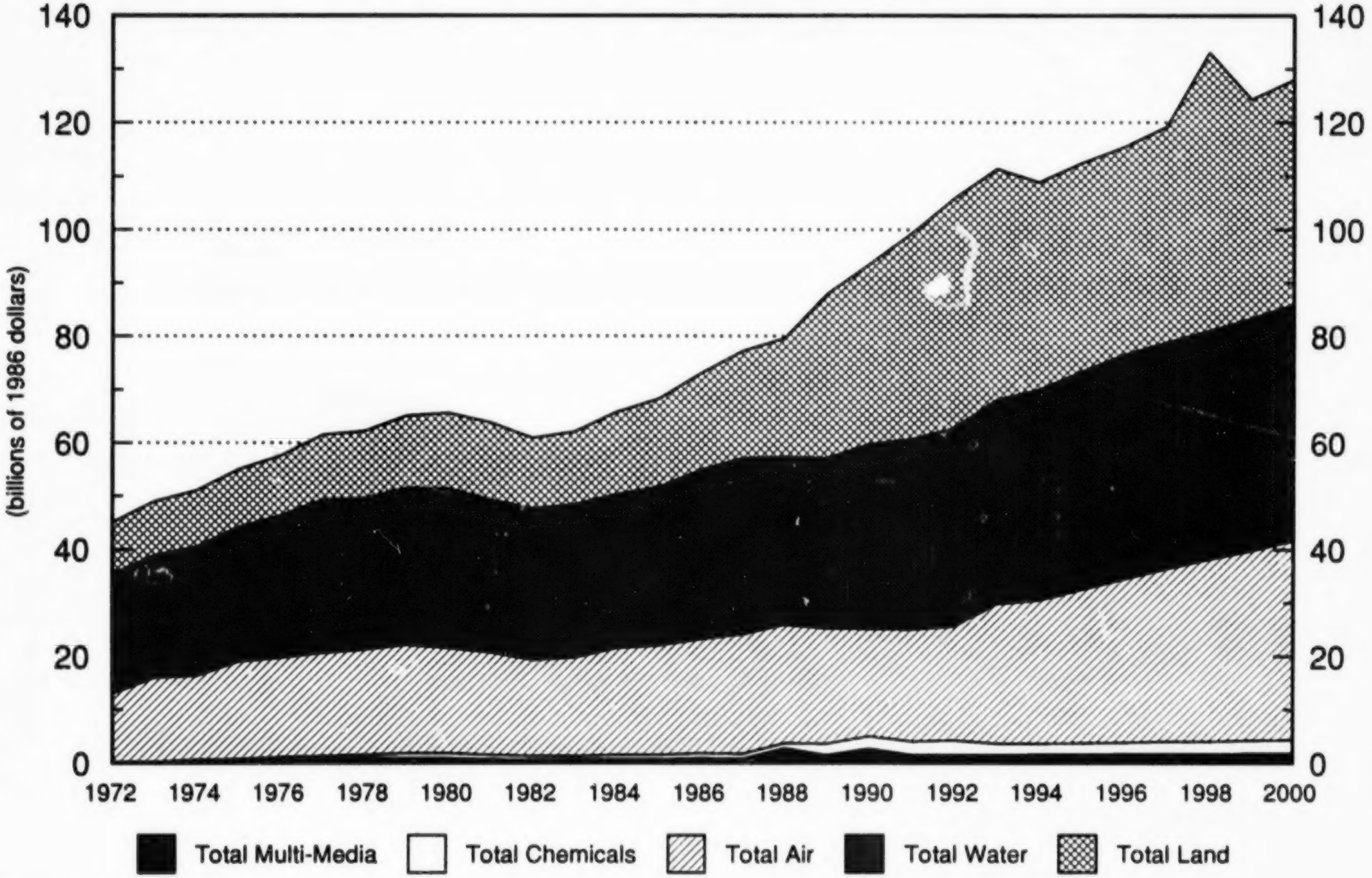
Source: Table 8-18A

Fig. 9-3: 1985 INTERNATIONAL POLLUTION CONTROL EXPENDITURES AS A PERCENTAGE OF GDP



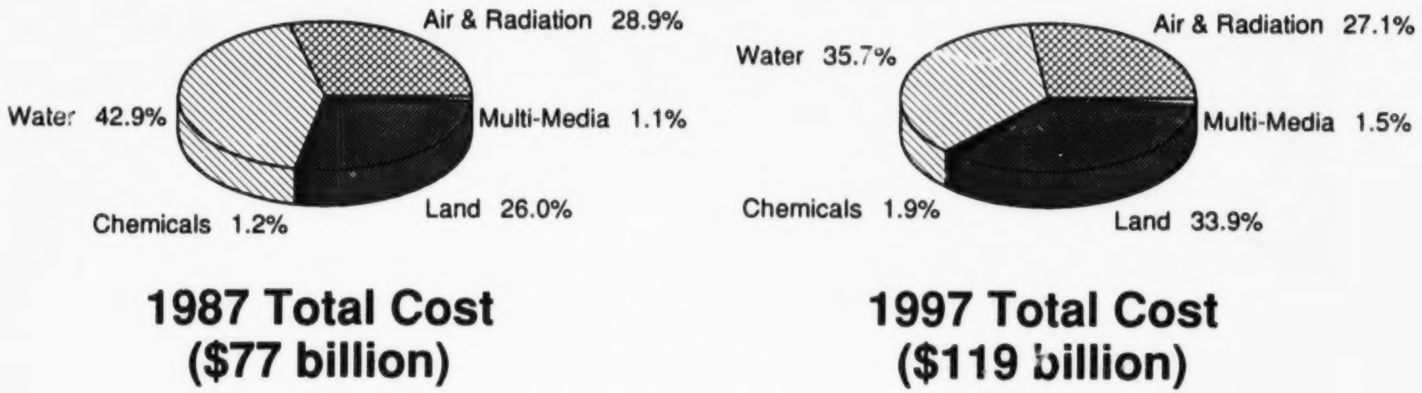
Source: Table 9-2
* Includes household expenditures

Fig. 9-4: TOTAL CAPITAL AND OPERATING COSTS BY MEDIUM



Source: Table 8-18A

Fig. 9-5: PERCENTAGE OF CAPITAL PLUS OPERATING COSTS BY MEDIUM

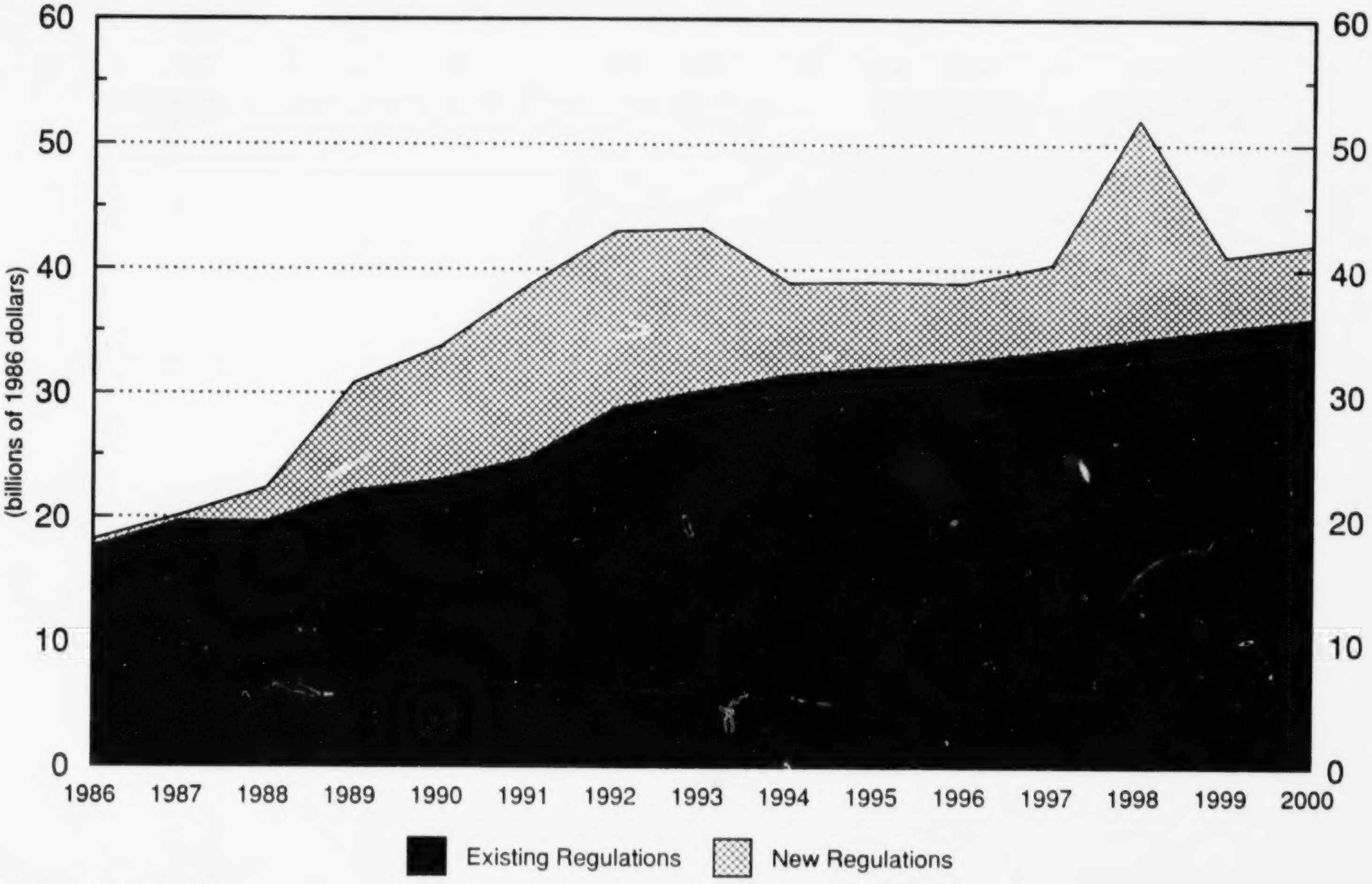


1987 Total Cost
($77 billion)

1997 Total Cost
($119 billion)

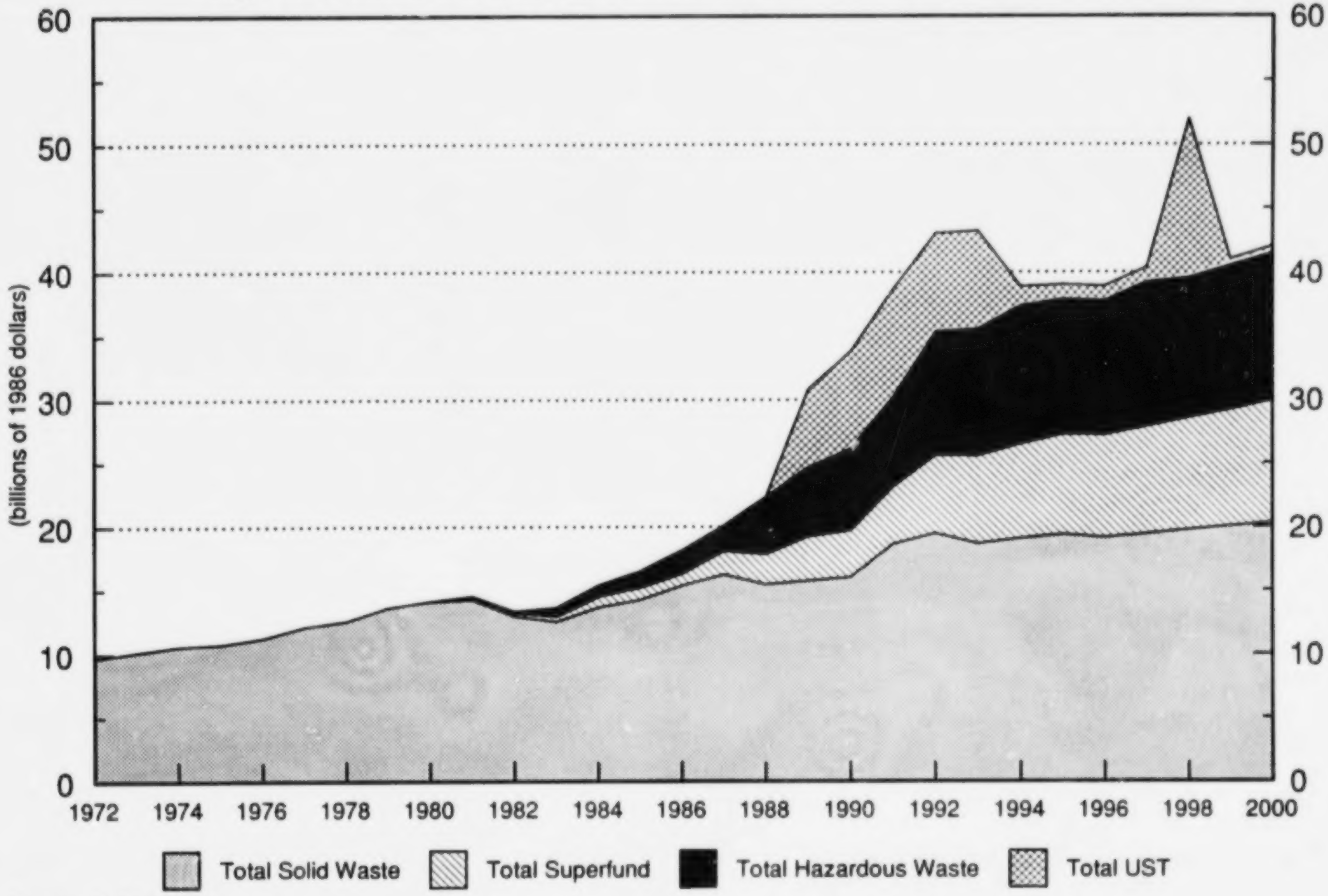
Source: Table 8-18

Fig. 9-6: TOTAL LAND CAPITAL AND OPERATING COSTS BY TYPE



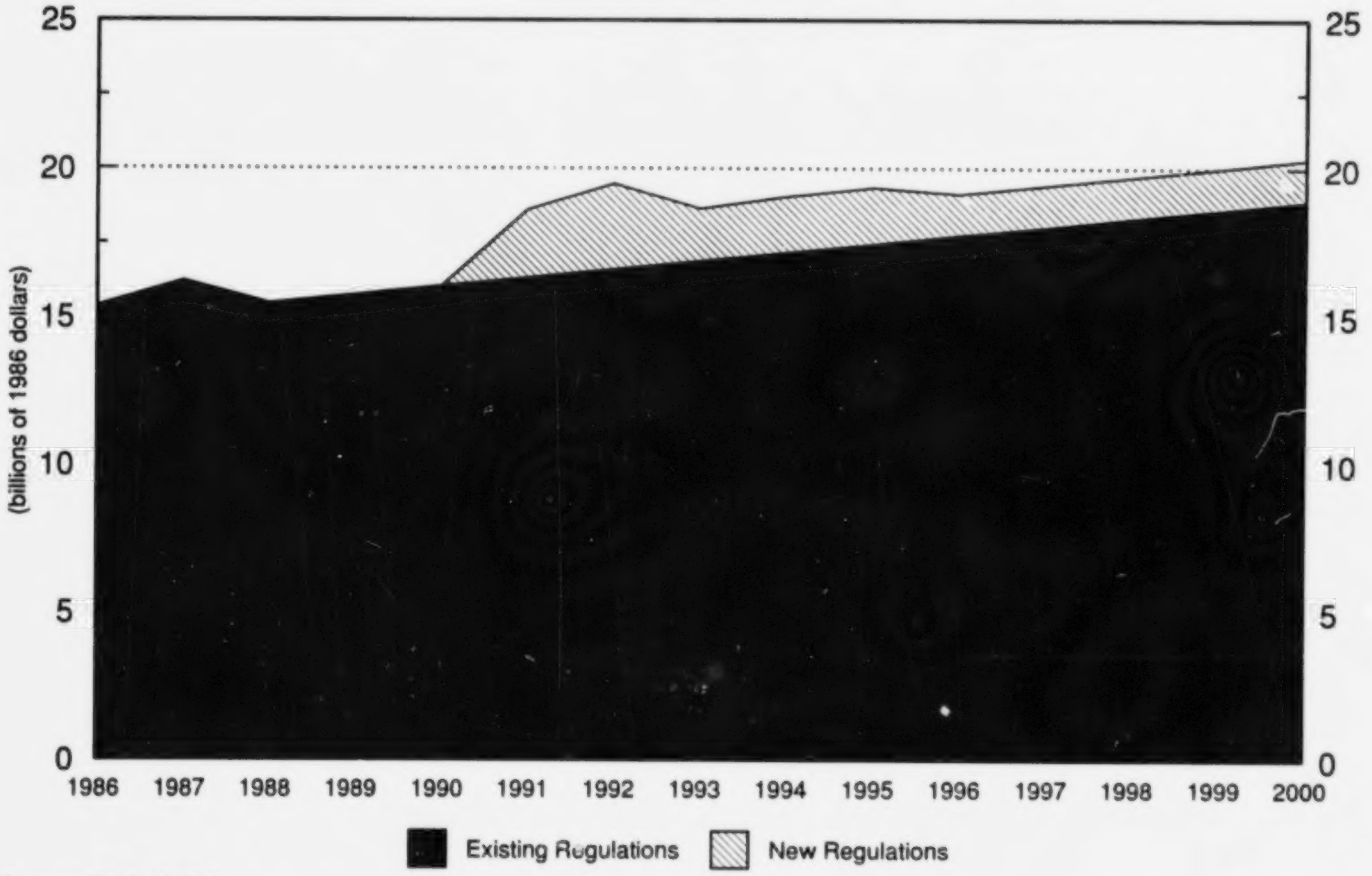
Source: Table 8-18A

Fig. 9-7: TOTAL LAND CAPITAL AND OPERATING COSTS BY PROGRAM



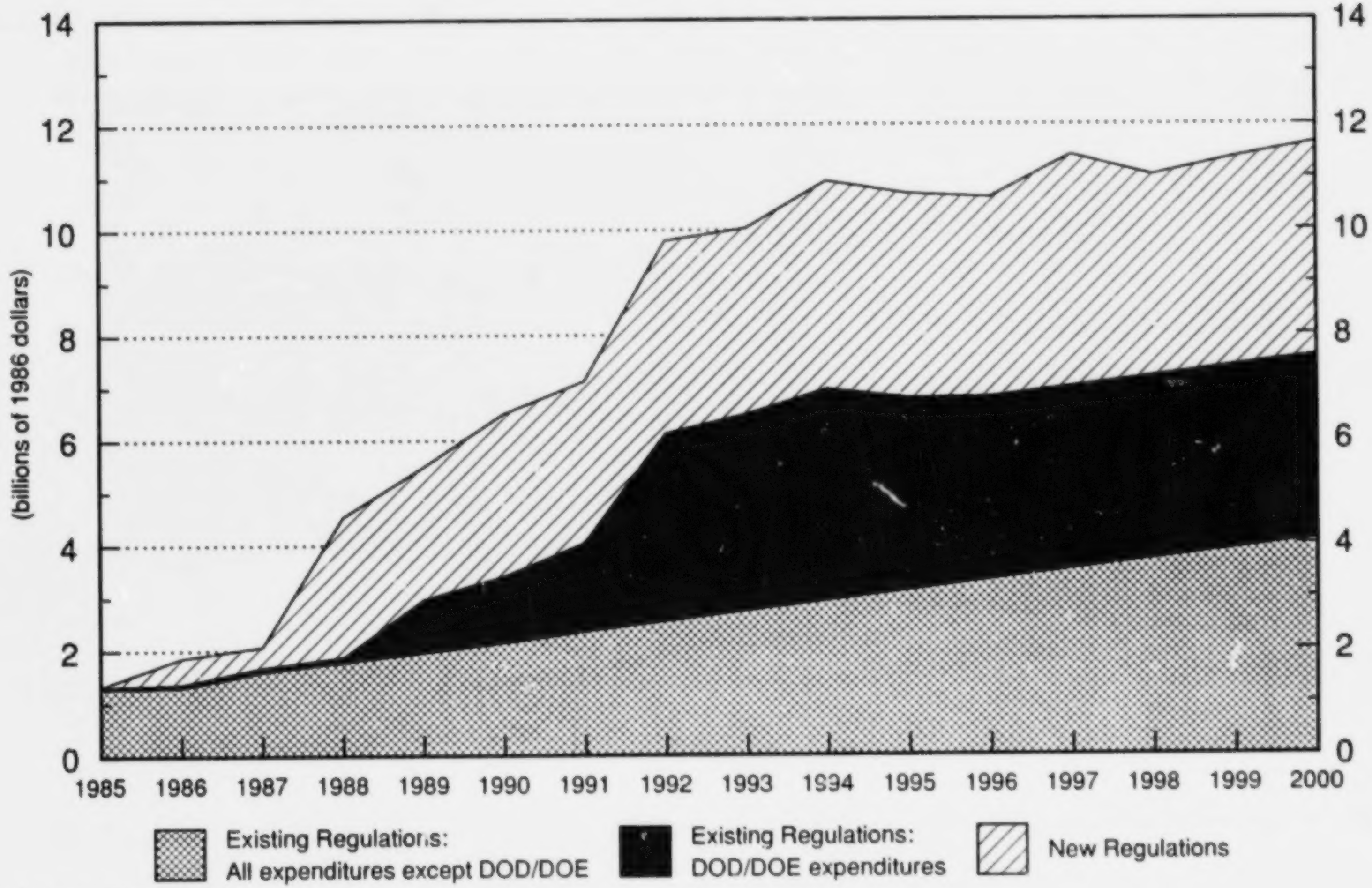
Source: Table 8-18A

Fig. 9-8: SOLID WASTE CAPITAL AND OPERATING COSTS BY TYPE



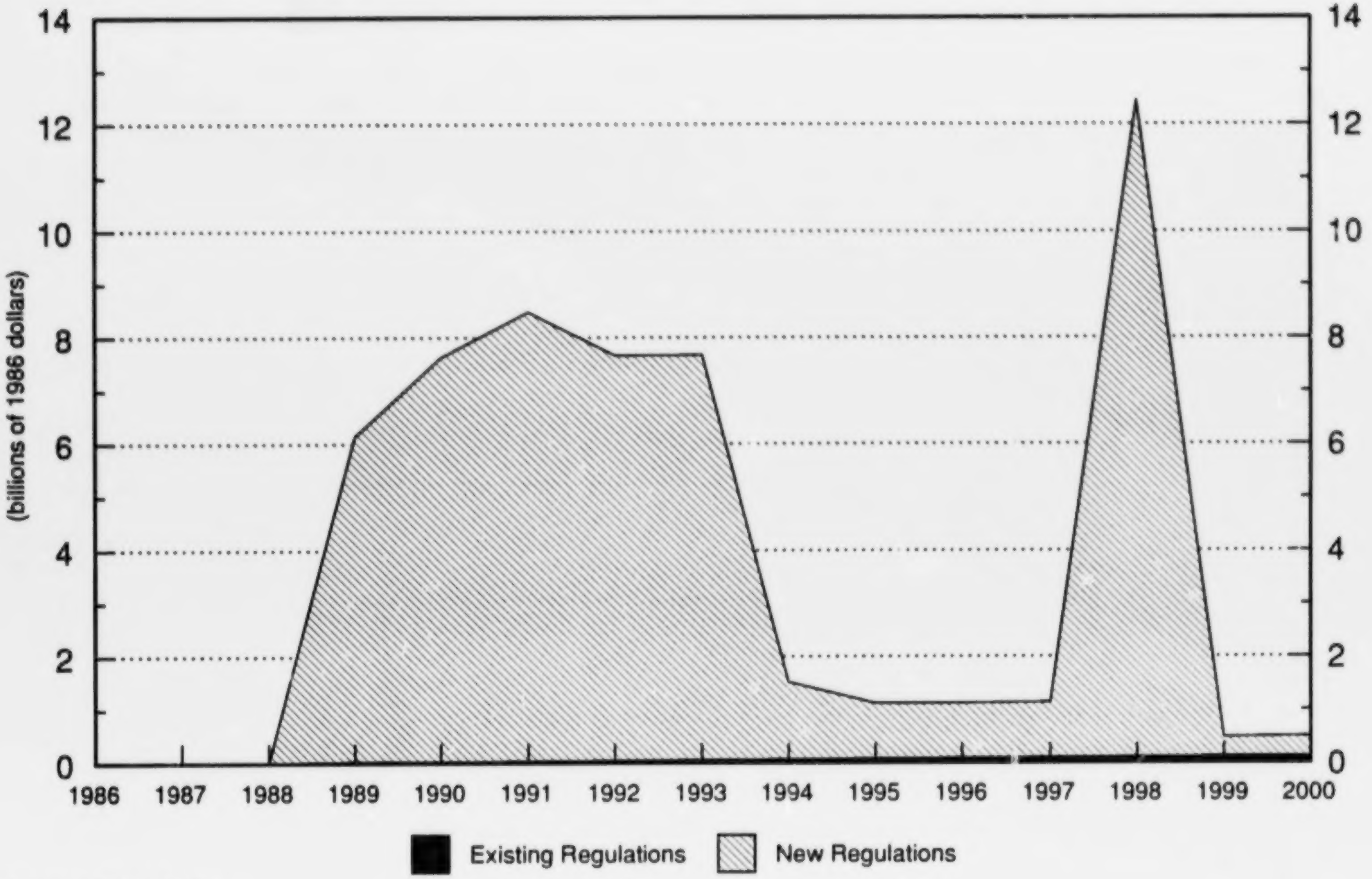
Source: Table 8-18A

Fig. 9-9: HAZARDOUS WASTE CAPITAL AND OPERATING COSTS BY TYPE



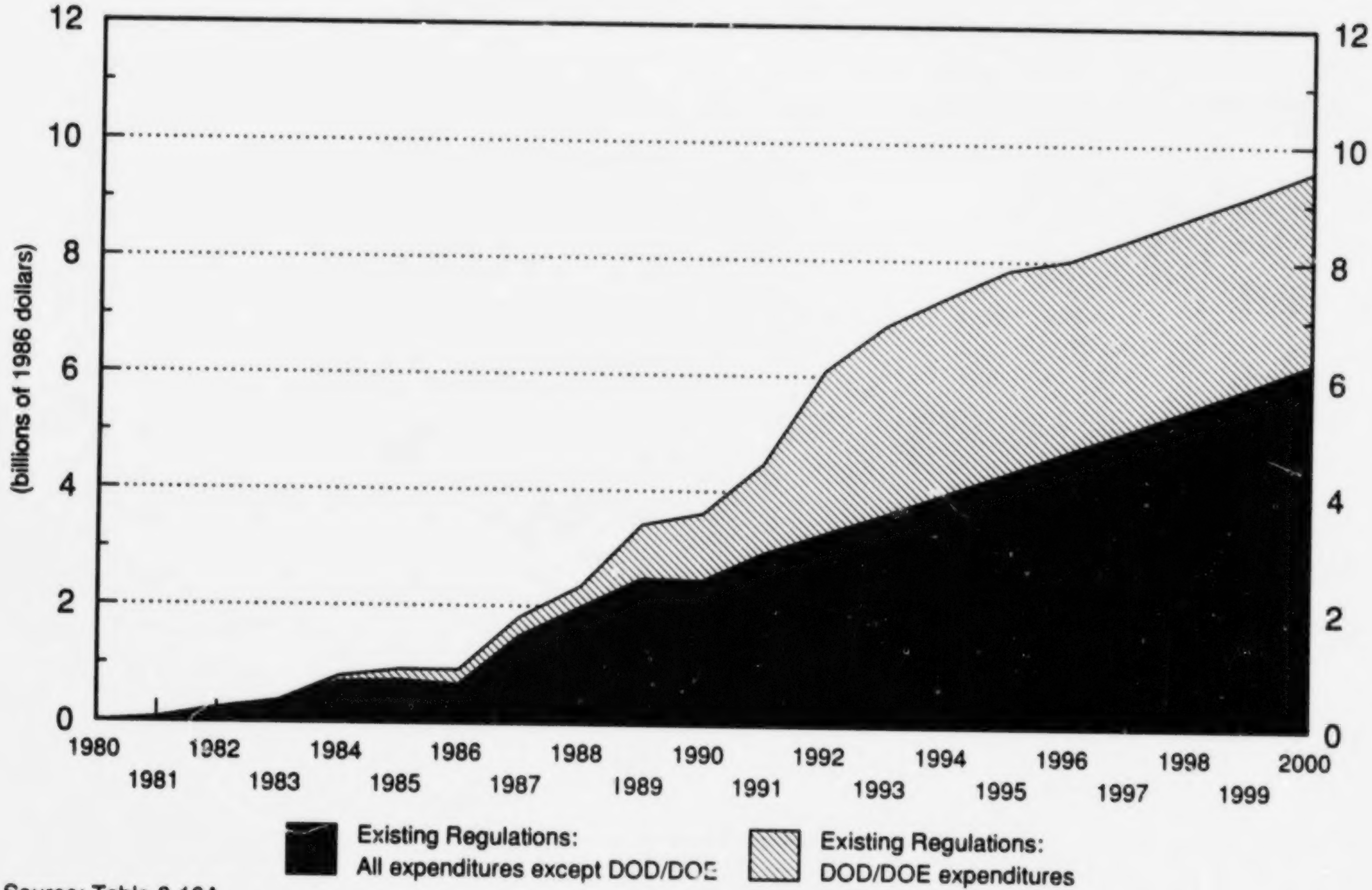
Source: Table 8-18A

Fig. 9-10: UST CAPITAL AND OPERATING COSTS BY TYPE OF REGULATION



Source: Table 8-18A

Fig. 9-11: SUPERFUND CAPITAL AND OPERATING COSTS BY TYPE



Source: Table 8-18A

Table 9-1: NON-HOUSEHOLD CAPITAL PLUS OPERATING EXPENDITURES

(millions of 1986 dollars)

Line (Report Section)		1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
A.	Total Expenditures	44,960	48,995	50,981	54,975	57,536	61,436	62,150	65,127	65,482	63,804	60,916	62,052	65,664	68,193	73,038
A.1	Gross Domestic Product ($billions)	2,750	2,911	2,924	2,944	3,115	3,307	3,513	3,600	3,589	3,670	3,585	3,711	3,959	4,080	4,197
A.2	Total Expenditures as % of GDP	1.635	1.683	1.743	1.867	1.847	1.858	1.769	1.809	1.825	1.738	1.699	1.672	1.659	1.671	1.740
B.	Household Capital Costs															
(3.1.2)	Household Mobile	208	442	343	2,446	2,861	3,142	3,277	3,095	3,102	3,607	3,382	4,031	4,969	5,347	5,484
(3.2)	Private Radon															1
(4.1.1)	Septic System Cleaning	3,231	3,555	2,691	2,059	2,277	2,675	2,934	2,923	2,340	1,933	1,959	2,280	2,612	2,483	2,582
(5.1)	Household Solid Waste	75	80	81	78	76	76	77	79	80	79	77	78	82	90	96
B.1	Total Household Capital Costs	3,514	4,077	3,114	4,582	5,214	5,892	6,288	6,096	5,523	5,619	5,418	6,390	7,663	7,921	8,163
C.	Household Operating Costs															
(3.1.2)	Household Mobile	957	1,497	1,479	1,209	965	890	686	451	263	(98)	(343)	(253)	(486)	(625)	(469)
(3.2)	Private Radon															
(4.1.1)	Septic System Cleaning	622	635	559	522	528	533	530	519	487	473	468	470	501	560	595
(5.1)	Household Solid Waste	1,371	1,415	1,430	1,465	1,455	1,504	1,593	1,612	1,696	1,635	1,608	1,607	1,647	1,735	1,831
C.1	Total Household Operating Costs	2,950	3,547	3,468	3,196	2,948	2,927	2,809	2,582	2,445	2,010	1,732	1,824	1,661	1,669	1,957
D.	Total Costs Less Household Costs	38,496	41,372	44,398	47,197	49,374	52,616	53,053	56,449	57,514	56,174	53,765	53,838	56,340	58,603	62,919
D.1	Non-household Costs as a % of GDP	1.400	1.421	1.518	1.603	1.585	1.591	1.510	1.568	1.603	1.531	1.500	1.451	1.423	1.436	1.499

Footnotes to Table 9-1 by line:

A. Total capital plus operating expenditures as shown in Table 8-18.

A.1. As given in the *Economic Report of the President*, February 1990, p. 304, adjusted to 1986 dollars using the GNP price deflators shown in Table 1-2.

A.2. Total capital plus operating costs divided by line A.1.

B. Household capital expenditures included in this Report under Section:

3.1.2. Expenditures by individuals for motor vehicle emission abatement devices. From line 2 of Tables C-2 and C-8. It is assumed that only light duty vehicles and motorcycles are purchased by the household sector. Some light duty vehicles are purchased by business and government, but this may be compensated for by the fact that some trucks and aircraft are purchased by the household sector.

3.2. Expenditures by individuals for radon control devices. From private new regulations on this line of Table 3-1B since this represents household investment in radon control.

4.1.1. **Expenditures by households for septic system and lateral (connectors to sewer lines) investment. Based on data supplied to the Organization for Economic Cooperation and Development (OECD) by the Bureau of Economic Analysis of the Department of Commerce.**

5.1. **Expenditures by households for solid waste collection and disposal capital for handling household solid waste by private contract and self-service methods. Based on data supplied to OECD by the Bureau of Economic Analysis of the Department of Commerce.**

C. **Household operating expenditures included in this Report under Section:**

3.1.2. **Expenditures by individuals to operate and maintain motor vehicle emission abatement devices. From line 3 of Tables C-2 and C-8.**

3.2. **Expenditures by individuals to operate radon control devices. From private new regulations on this line of Table 3-2B.**

4.1.1. **Expenditures by households for septic system maintenance such as cleaning. Based on data supplied to OECD by the Bureau of Economic Analysis of the Department of Commerce.**

5.1. **Expenditures by households for solid waste collection and disposal. Data were supplied to OECD by the Bureau of Economic Analysis of the Department of Commerce.**

D. **Total capital plus operating expenditures less total household capital and operating expenditures (line A.1 minus lines B.1 and C.1).**
D.1. **Total non-household capital plus operating expenditures as a percentage of Gross Domestic Product (line D as a percentage of line A.1).**

Table 9-2: CAPITAL PLUS OPERATING EXPENDITURES FOR SOME OECD COUNTRIES AS A PERCENTAGE OF GROSS DOMESTIC PRODUCT

Country	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
United States															
Non-household	1.40	1.42	1.52	1.60	1.59	1.59	1.51	1.57	1.60	1.53	1.50	1.45	1.42	1.44	1.50
Including household	1.64	1.68	1.74	1.87	1.85	1.86	1.77	1.81	1.83	1.74	1.70	1.67	1.66	1.67	1.74
Austria					1.09	1.16	1.10	1.13							
Finland									1.31	1.19	1.24	1.12	1.10	1.32	1.16
France															
Non-household										0.87	0.86	0.85	0.84	0.85	0.89
Including household														1.10	1.15
West Germany				1.37	1.36	1.29	1.33	1.37	1.45	1.45	1.45	1.41	1.37	1.52	
Netherlands									1.11		1.18			1.26	
Norway														0.82	
United Kingdom						1.66				1.57				1.25	

Footnotes to Table 9-2

United States: Table 9-1, lines D.1 and A.2.

All other countries: Represent non-household expenditures, except as noted in the case of France, as shown in Organization for Economic Co-operation and Development, *Pollution Control and Abatement Expenditure in OECD Countries: A Statistical Compendium*, OECD Environment Monographs No. 38, November 1990, p. 40.

Table 9-3: POTENTIAL INCREASES IN ANNUAL CHARGES BY CITY SIZE BY THE YEAR 2000

(1986 dollars per household)

Municipality Size Category (population)	Number of Municipalities	Types of Regulations				
		Wastewater	Drinking Water	Solid Waste	Miscellaneous	Total
0 - 2,500	26,315	45	40	26	59	170
2,500 - 10,000	6,279	20	15	23	32	90
10,000 - 50,000	2,694	20	5	32	23	80
50,000 - 250,000	463	20	10	28	12	70
Over 250,000	59	60	15	51	34	160

Footnotes to Table 9-3

User charge increases have been calculated using weighted average costs of new regulations. The costs that a municipality may incur will depend on the regulations it has to comply with.

Source: U.S. Environmental Protection Agency, *The Municipal Sector Study: Impacts of Environmental Regulations on Municipalities*, Office of Policy, Planning and Evaluation, Report EPA-230-09/88-038, September, 1988, p. v.

10. ENVIRONMENTAL TRENDS

This chapter presents data and information on historical trends in various measures that are suggestive of the level of environmental quality over time. The objective is to provide some indication of the "output" of the pollution control costs presented in this report. As only indicators of environmental quality, these data are not readily comparable to the monetary cost estimates. Pollution controls have resulted in substantial and valuable national benefits in the form of improved human health, recreational opportunities, visibility, and general environmental integrity. An ideal comparison of the costs and benefits of pollution control would require that these benefits be identified, quantified, and monetized. This is an extremely difficult and data intensive task and far beyond the scope of this report.

Instead, this chapter relies on historical data on estimated air and water pollutant emissions and ambient pollution levels, and information on the production and regulation of hazardous waste and toxic substances to provide an indication of environmental quality levels over time. While this provides some indication of changing environmental quality levels, it does not adequately show the degree of environmental protection afforded by cumulative pollution control efforts. In the absence of controls, increasing population and levels of economic activity would have resulted in steadily decreasing environmental quality over time. In order to adequately show environmental quality improvements resulting from pollution controls, we would need to compare current levels of environmental quality indicators with estimated levels that would have prevailed in the absence of cumulative pollution control efforts. Except in the case of the criteria air pollutants emissions, such comparisons are precluded by the available data. For all other environmental indicators discussed in this chapter, no data are available on what these might have been in the absence of pollution control efforts.

The data presented for different environmental media and regulatory program areas are of widely varying quantity and quality. As might be expected, nationwide data on the more mature pollution control programs, such as those directed to air and water quality, are more extensive and better than those for the newer regulatory programs. The data and information on various environmental quality indicators are shown in Figures 10-1 through 10-15, and Tables 10-1 through 10-13. These data are summarized below in the following sections:

10.1. Air Quality;
10.2. Water Quality;
10.3. Land Quality; and
10.4. Exposure to Chemicals.

10.1. AIR QUALITY

Historical trends in emissions of the six criteria air pollutants or their precursors—particulate matter(PM), sulfur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOCs), carbon monoxide (CO), and lead (Pb)—and trends in ambient air quality with respect to these pollutants are discussed in this section. Because one of the criteria air pollutants, ozone, is a secondary pollutant formed by the reaction of reactive volatile organic compounds and nitrogen oxides, emissions of reactive volatile organic compounds and nitrogen oxides (a criteria pollutant in its own right) are measured rather than ozone. The data indicate that since 1970 there has been a substantial decrease in emissions of these six pollutants except nitrogen oxides. In terms of ambient air quality, clear improvements have been observed with respect to every criteria pollutant (the same six pollutants with ozone substituted for volatile organic compounds) except ozone. The experience with ozone has been mixed. Despite these improvements, many regions of the country are still not in compliance with the National Ambient Air Quality Standards (NAAQSs) associated with one or more of the criteria pollutants.

10.1.1. Pollutant Emissions

Table 10-1 presents estimates of national emissions over the period 1940-1988 by source category for particulate matter, sulfur oxides, nitrogen oxides, volatile organic compounds, carbon monoxide and lead.[1] (The data for lead in years prior to 1970 are incomplete.) According to these estimates, emissions of all the criteria air pollutants except nitrogen dioxide fell between 1970 and 1988. Historical emissions for each criteria pollutant are discussed separately below.

10.1.1.1. Particulates

Over the period 1970-1988, total air emissions of particulates declined by 63 percent. Emissions from industrial and stationary fuel combustion sources decreased significantly over the period due to the introduction of pollution controls on these sources. Solid waste emissions also declined as a result of restrictions on solid waste burning. Emissions from transportation sources increased slightly over the period, however. This is probably due to the large increases in the number of motor vehicles and miles travelled over time, which have offset the benefits of increasingly stringent pollution control requirement on mobile sources.

10.1.1.2. Sulfur Oxides

Over the period 1970-1988, total air emissions of sulfur oxides declined by approximately 28 percent. Stationary fuel combustion source emissions declined by 23 percent due in part to greater reliance on low sulfur fuels and in part to limited pollution control requirements. Industrial emissions decreased by 47 percent as a result of the introduction of controls on smelters and sulfuric acid plants. Emissions from transportation sources, which historically have accounted for a relatively small portion of total emissions, increased by approximately 30 percent over the period. Again, this is probably the result of significant increases in the number of vehicles and miles travelled over time.

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[1] These data are from: U.S. Environmental Protection Agency, *National Air Pollution Estimates 1940-1988*, Office of Air Quality Planning and Standards, National Air Data Branch, March 1990, and other reports in this series, 1984-1987.

10.1.1.3. Nitrogen Oxides

Total air emissions of nitrogen oxides increased by approximately seven percent over the period 1970-1988. Emissions from transportation sources, which increased by approximately 123 percent from 1970 to 1980, have since fallen back to year 1970 levels. Emissions from stationary fuel combustion sources increased approximately 18 percent. This increase probably would have been much greater were it not for the introduction of pollution controls on coal-fired electric utility boilers. Industrial source emissions, which have historically been relatively low, did not change over the period. Solid waste emissions, which also have been relatively low, decreased by more than 50 percent.

10.1.1.4. Volatile Organic Compounds

Over the period 1970-1988, total emissions of volatile organic compounds declined by 25 percent. Transportation source emissions declined by 40 percent due to the adoption of air pollution controls on motor vehicles. Industrial source emissions declined only slightly, however, and remain the largest source of total VOC air emissions. Stationary fuel combustion source emissions, which are a relatively small portion of total emissions, increased by approximately 30 percent over the period. This increase is probably the result of higher levels of residential fuel combustion. Solid waste emissions of VOC declined by 40 percent over the period.

10.1.1.5. Carbon Monoxide

Total emissions of carbon monoxide declined by 39 percent over the period 1970-1988. Transportation emissions, by far the major source, decreased by 44 percent as a result of emission controls on motor vehicles, despite an increasing number of vehicles and miles driven. Stationary fuel combustion sources, on the other hand, increased by 64 percent from 1970 to 1988, due in part to increased levels of residential wood burning. Industrial source emissions declined by 48 percent due to the elimination of outdated processes and limited application of pollution controls. Solid wastes, which have historically accounted for the second largest share of carbon monoxide air emissions, declined by 43 percent over the period.

10.1.1.6. Lead

Over the period 1970-1988, emissions of lead declined by over 96 percent. Transportation emissions, which accounted for over 80 percent of total lead emissions in 1970, declined by more than 98 percent from 1970 to 1980 due to the move towards unleaded gasoline. Emissions from industrial and stationary fuel combustion sources, which are the second and third largest sources of airborne lead, respectively, each declined by more than 90 percent over the period as a result of pollution control requirements. Emissions from solid wastes declined by 63 percent over the period.

10.1.2. Effects of Pollution Controls on Air Emissions

Table 10-2 shows the estimated impact that air pollution controls have had on emissions of the six criteria air pollutants or their precursors. Actual emissions in each of the years 1984-88 are compared to estimates of emissions that would have occurred in these years if pollution controls pursuant to the Clean Air Act had not been introduced. Figure 10-1 shows actual emissions for years 1984-1988 as a percentage of hypothesized emissions in these years at the 1970 level of control.

The data indicate that by 1984 air pollution controls had resulted in substantial reductions in air emissions for all of the criteria air pollutants from levels that would have been observed in the absence of controls:

ACTUAL EMISSIONS AS A PERCENTAGE OF EMISSIONS
USING 1970 LEVELS OF CONTROL

Year	Particulate Matter	Sulfur Dioxide	Nitrogen Oxides	Volatile Organic Compounds	Carbon Monoxide	Lead
1984	33	71	82	60	56	19
1988	30	58	72	58	43	3

For example, particulate matter emissions were 33 percent of what they would otherwise have been without the introduction of additional controls since 1970. In other words, pollution controls adopted since 1970 eliminated an estimated 67 percent of the particulates that would otherwise have been emitted into the atmosphere in 1984. By this measure, there has been continued improvement in air emissions since 1984, as shown in Figure 10-2, which illustrates actual emissions in 1988 as a percentage of estimated 1988 emission at the 1970 level of control.

10.1.3. Ambient Air Quality

Figures 10-4 through 10-9 show boxplot trends in ambient air concentrations of the six criteria air pollutants—particulates, sulfur dioxide, nitrogen dioxide, ozone, carbon monoxide and lead—between the years 1979 and 1988.[2] Air quality data before the mid-1970s are of questionable quality, and thus are not included in the estimated trends. Below, the boxplots are used to examine trends in average ambient pollutant concentrations over time and to compare estimated concentrations with the NAAQS for each pollutant.

Taken as a whole, the data show a downward national trend in average ambient concentrations for the criteria air pollutants over the ten year period. Annual average concentration of particulates fell by over 20 percent over the period; sulfur oxide concentrations by over 35 percent; carbon monoxide concentrations by about 32 percent; and lead concentrations by 88 percent. Moreover, except in the case of ozone, between 75 and 90 percent of all sites sampled showed average pollutant concentrations less than or equal to the NAAQS for each pollutant.

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[2] Refer to Figure 10-3 for an explanation of the plotting conventions used in the boxplots.

There are many regions of the country that are not in compliance with one or more NAAQS, however. In 1987, an estimated 21.5 million people lived in counties where average particulate levels were above the NAAQS for particulate matter; 1.6 million people lived in areas that exceeded the sulfur dioxide standards; 29.4 million people lived in areas that exceeded the carbon monoxide standards, 7.5 million people lived in areas that exceeded the standard for nitrogen dioxide level; 2.8 million people lived in areas that exceeded the lead standard; and 88.6 million people lived in areas where ozone levels were above the NAAQS level.

10.2. WATER QUALITY

In recent years, pollutant loadings for both industrial and municipal point source of water pollution have been well below those experienced in the early 1970s. Municipal point source improvements are primarily the result of better control technology. Industrial point source improvements are also the result of increased and improved control technology, as well as manufacturing process changes and increased discharges to public treatment facilities. While municipal discharges are now well below those experienced in 1970, they have been steadily increasing in recent years. Moreover, the available evidence suggests that improvements in in-stream water quality resulting from decreased point source pollution loadings have been negated to a large extent by increasing pollution loadings from non-point sources. Water pollution discharges and estimates of ambient water quality are discussed in more detail below.

10.2.1. Discharges

Data on pollutant discharges to water bodies are summarized in Tables 10-3 through 10-5. The data, which shows direct discharges from municipal and industrial point sources as well as non-point sources, are discussed below.

10.2.1.1. Municipal

Table 10-3 presents data on municipal treatment plant discharges of total suspended solids (TSS) and biological oxygen demand (BOD), two traditional water pollution indicators, in selected years over the period 1960-1988. The population levels served by municipal systems in these years are also shown in the table. The data shows that discharges of both pollutants increased significantly over the period 1960-1973. By 1980, the level of both pollutants had fallen considerably, however, but this was followed by a gradual rise in pollutant loadings over the 1980s. By 1988, municipal discharges of both TSS and BOD were comparable to those experienced in the 1960s, but were still well below the year 1973 levels.

The increase in pollution loadings from municipal treatment plants in recent years is probably due to a large increase in the volume handled by such facilities. This is the result of an increase in the number of people served by municipal systems, as well as a significant increase in the amount of industrial and commercial wastes, both pretreated and untreated, being processed by municipal treatment plants. The increase in the volume of wastes handled by municipal systems would probably have resulted in much greater discharges of pollutants had it not been for expanded pollution controls. Improved water pollution controls have resulted in "cleaner" discharges from these facilities in terms of lower concentrations of pollutants per volume of wastewater released into waterways.

10.2.1.2. Industrial

Table 10-4 shows direct discharges of TSS and BOD in 1973 and the period 1982-1987 for major industrial categories. The data show that for these industries, total industrial discharges of BOD declined by 93 percent over the two time periods, and discharges of suspended solids declined by 96 percent. One important reason for these declines is that more industrial wastes are being discharged to municipal treatment plants instead of directly to water bodies. Currently, only about 27 percent of total BOD discharges from these industries are made directly to water bodies, and only 39 percent of suspended solids discharges.[3] Better and more widely applied control technology and treatment techniques as well as manufacturing process changes are also responsible for the dramatic reduction in direct discharges from industrial sources.

Total municipal and industrial water discharges in 1973 and in the mid-1980s are shown graphically in Figure 10-10 in order to highlight the significant reductions in conventional pollutant discharges over time. The biggest reduction was in discharges of total suspended solids, although there was also a significant reduction in biological oxygen demand over this period.

10.2.1.3. Non-point Source

Table 10-5 shows data on discharges of four conventional water pollutants—biological oxygen demand, suspended solids, nitrogen, and phosphorus—from various non-point and point sources in years 1973 and 1980. The non-point sources include agriculture, silviculture, and urban runoff. The point sources include municipal and industrial discharges. The table also shows the shares of total discharges of conventional pollutants accounted for by non-point and point sources, respectively, in each of the two years. Comparisons of the point and non-point sources of discharges are useful even though they are limited somewhat by gaps in the available data.

The data indicate that discharges of each pollutant except nitrogen increased significantly between 1973 and 1980. Nitrogen discharges are shown to have decreased slightly over the period due to the reported year 1973 nitrogen loadings from silviculture, which are eighteen times that reported for 1980. This large discrepancy may well be the result of differences in the sampling methodology used to measure forest discharges of nitrogen over the two years, however. The data also show that the increases in year 1980 discharges over those experienced in 1973 are the result of increased non-point source loadings. In general, point source discharges decreased from 1973 to 1980, but this was more than made up for by large increases in non-point source discharges. The increase in non-point source discharges was driven primarily by agricultural discharges, which historically have accounted for the bulk of all non-point loadings. In 1980, agricultural discharges of each of the conventional pollutants listed in Table 10-5 were more than 60 percent of those experienced in 1973.

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[3] U.S. Environmental Protection Agency, *Summary of Effluent Characteristics and Guidelines for Selected Industrial Point Source Categories*, Office of Water Regulations and Standards, October 1988.

Taken as a whole, the data indicate that discharges of conventional water pollutants have been increasing over time. Moreover, while point-source discharges appear to be decreasing, non-point source loadings are increasing and more than offsetting point source gains. Finally, the data suggests that non-point sources account for the vast majority of all discharges of conventional water pollutants. This conclusion is backed by more recent research that found that non-point sources account for almost 100 percent of total sediment loadings, 84 percent of phosphorous loadings, and 82 percent of nitrogen loadings.[4]

10.2.2. Ambient Water Quality

Figure 10-11 includes the results of water pollution sampling at various stations around the country in years 1974 to 1981. The table shows the number of sampling stations that recorded increased or decreased levels of a variety of common water pollutants and trace elements in some year in the period 1974-1981 as compared to the previous most recent sampling results. The results for several pollutants are discussed below.

Stations with observed decreases in dissolved oxygen deficits, which result from BOD loadings, outnumbered stations with increasing values three to two, suggesting success in point source control by industry over the period. Decreases in fecal bacteria were also widespread and might be attributed to the success of municipal treatment systems.

The summary conclusions of the source[5] for the Figure 10-11 data indicate that much of these point source gains have been offset by increases in non-point source loadings. Some of these conclusions with regards to non-point sources discharges follow below.

Increases in suspended sediments are closely associated with land uses that historically have had high soil erosion rates. In other words, non-point sources are primarily responsible for the observed increases in this pollutant. Decreases in phosphorous levels over the period were attributed to point source controls, while phosphorus increases were attributed to increased levels of non-point source loadings. Nitrates increased significantly and were strongly associated with fertilized land and land supporting livestock. Additionally, atmospheric deposition of nitrogen, although small, was found to be significant in the East and Midwest regions of the country. Increases in sodium, chloride, and sulfate were attributed to the use of highway salts and to surface coal mining. Increased levels of arsenic and cadmium suggest increased atmospheric deposition from fossil fuel combustion. The significant decreases shown for lead were attributed to the decline in atmospheric deposition of lead from vehicular fuel combustion.

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[4] Leonard P. Gianessi, et al., *Nonpoint Source Pollution: Are Cropland Controls the Answer?*, Resources for the Future, 1986.

[5] R.A. Smith, et al., "Water Quality Trends in the Nation's Rivers", *Science*, V. 235, March 1987.

10.3. LAND QUALITY

10.3.1. Hazardous Waste Management

Table 10-6 presents estimates of hazardous waste generation and management in years 1981 and 1985 based on two national surveys conducted in the early and mid-1980s, respectively.[6] Direct comparison of the two data sets are limited somewhat by changes in the definition of hazardous waste and waste generators for the year 1981 and 1985 data. Some general comparisons can be made, however, and these are useful because they span years before and after much of the first phase of RCRA regulations were put in place. Most of the current RCRA regulatory program was implemented after 1985, however, and thus is not reflected in the data.

The data show that only slight more waste was generated in 1985 than in 1981. The slightly higher waste generation reported in 1985 was most likely due to the wider definition of hazardous waste used in the later survey and its inclusion of more than three times the number of small-quantity generators than were included in year 1981 survey. The relative shares of total wastes accounted for by different classes of generators changed somewhat between the two years, however. While the share of total waste generation accounted for by chemical and petroleum industries was slightly more than 70 percent in each of the two years, the share accounted for by metals-related industries dropped significantly from 1981 to 1985. The data also show that there were more commercial treatment, storage, and disposal facilities in 1981 than in 1985. Some facilities probably closed after 1981 due to lack of certification or profitability, or concern about more stringent prospective regulation.

Table 10-7 includes data on the use of the various waste treatment and disposal options for years 1983-1987 collected in a national survey of selected commercial hazardous waste management firms.[7] The data show an increase in the use of incineration and landfill disposal options over the period, and a decrease in the use of deep-well injection. Recently promulgated rules restricting the land disposal of hazardous waste will most likely increase the use of waste recovery, treatment, and incineration in future years. Much waste will continue to landfilled, however, until alternative disposal options become more widely available.

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[6] The 1981 data are from: Westat, Inc., *National Survey of Hazardous Waste Generators and Treatment, Storage, and Disposal Facilities Regulated Under RCRA in 1981*, Prepared for the US EPA Office of Solid Waste, April 1984. The 1985 data are from: Research Triangle Institute, *1986 National Screening Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities*, Prepared for the US EPA Office of Solid Waste, September 1988.

[7] ICF, Inc., *1986-1987 Survey of Selected Firms in the Commercial Hazardous Waste Industry*, Prepared for the US EPA Office of Policy Analysis, 1988.

10.3.2. Hazardous Waste Remediation

Table 10-8 presents data on EPA activities under the Superfund Program, which is directed to cleaning-up abandoned hazardous waste sites. The data show that first-starts for hazardous waste removals, site investigation studies, remedial design studies, and remedial actions (*i.e.*, site clean-ups) increased steadily throughout the 1980s except for a drop in 1985-1986, when the controlling legislation was reauthorized. It should be noted that each type of activity takes well beyond one year to complete, and some activities, such as remedial actions, require several years for completion. Data for private sector activities under the program are not shown in the table. Private actions have increased steadily in recent years, but currently represent only about one-third of all Superfund activity.

10.3.3. Underground Storage Tanks

Table 10-9 shows data on the existing world of underground storage tanks and estimated rates of future growth in the use of different types of tanks. Bare steel tanks, currently the most widely used type, are expected to be phased out rapidly over the next several years and replaced with more leak resistance tank varieties required by the recently promulgated technical standards rule. Figure 10-12 shows the decline in the production of bare steel tank over the period 1980-1987. The figure also shows that production of protected tanks increased from roughly 15 percent of total tank production in 1980 to over 60 percent in 1987. Table 10-10 shows production data for protected tanks over the period 1980-1987.

10.4. EXPOSURE TO CHEMICALS

10.4.1. Toxic Substances

More than 65,000 chemical substances are licensed for manufacture or processing for commercial use in the United States. Figure 10-14 shows that notifications of intent to bring new chemicals into domestic production and/or use have been received by EPA for over 1000 new chemicals each year since 1982. This level of new chemical introduction is up sharply from levels experienced in the 1970s and early 1980s, and is expected to continue into the future. By the end of fiscal year 1985, EPA had received a cumulative total of 6,200 pre-manufacturing notices for new chemical introductions; this had jumped to 9,132 by the end of fiscal year 1987, however. As of 1987, EPA had prohibited or restricted the manufacture, use, or distribution of a total of 553 new chemicals.[8]

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[8] U.S. Environmental Protection Agency, *Environmental Progress and Challenges: EPA's Update*, EPA-230-07-88-033, August 1988.

Table 10-11 shows domestic production levels for selected industrial chemicals over the period 1960-1984. Generally, the data show increasing production of chemicals over time except for polychlorinated biphenols (PCBs) and benzene. Production of PCBs began to fall in 1973 and eventually ceased in 1978 as a result of an EPA ban on the chemical. (Figure 10-13 shows the persistence of PCBs in human tissue over the period 1972-1973). Benzene production also has decreased since 1980, reflecting EPA action to limit the uses of this chemical.

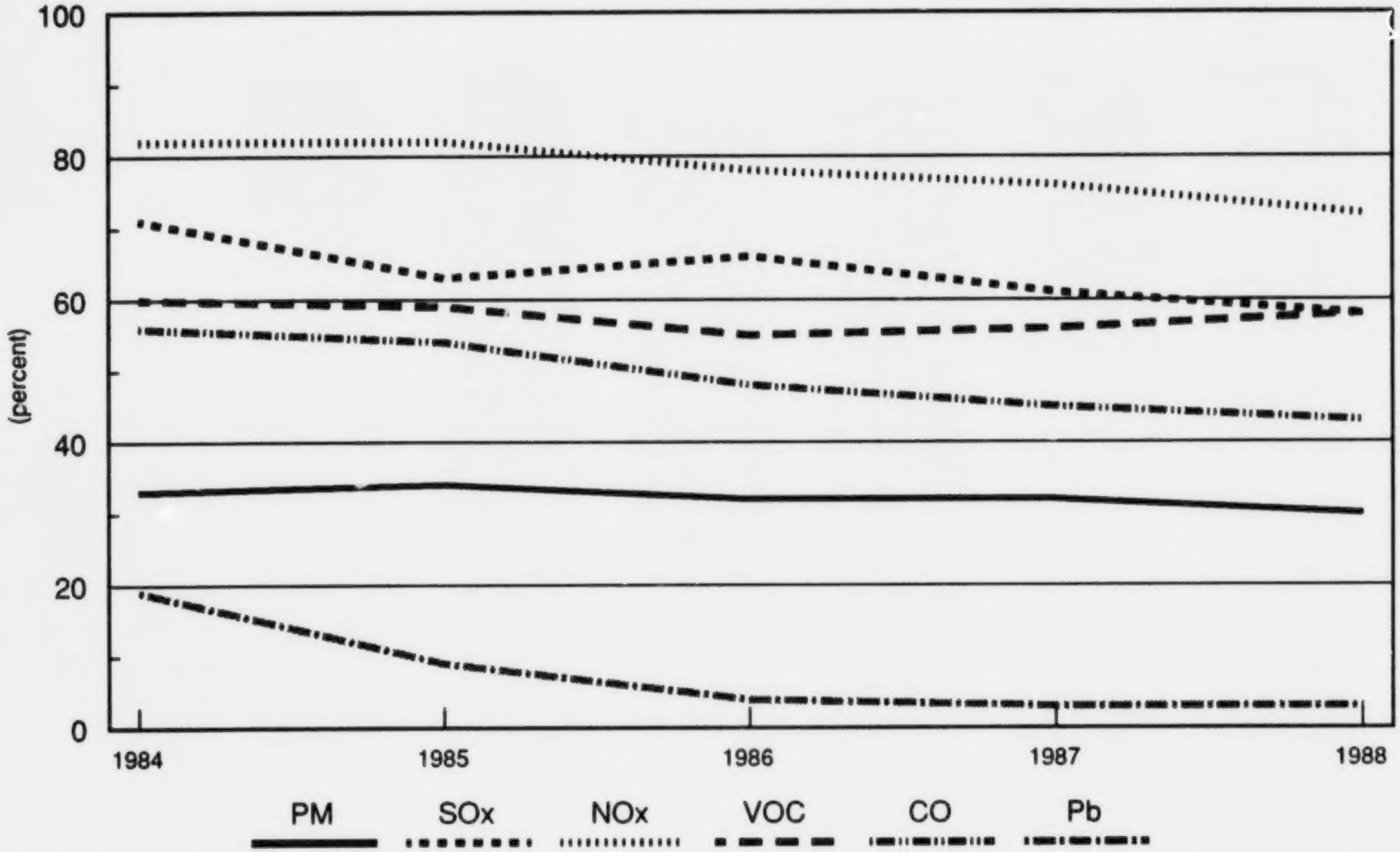
10.4.2. Pesticides

Table 10-12 shows data on annual use of pesticides in the U.S. and the estimated agricultural share over the period 1964-88. Table 10-13 shows total U.S. pesticide use by type over the period 1979-88. The data indicate that after increasing steadily over the 1960s and 1970s, pesticide use peaked in 1981 and has since fallen off somewhat. This is the result of the stabilization of agricultural pesticide use in recent years, which currently accounts for approximately 75 percent of total pesticide use. This trend towards lower use is probably the result of several factors, including lower application rates due to more efficient pesticide use and the introduction of more potent pesticides. The efficiency of pesticide use has improved as a result of more and better certification programs, more widespread use of integrated pest management techniques, and more detailed pesticide labelling. Increase interest in low input agricultural methods and reduced agricultural commodity price supports may further depress pesticide use in future years.

Table 10-14 shows the number of active ingredients that have been registered under FIFRA since 1967 for a variety of different pesticide types. Although the data show no clear trends, pesticide registration in the second decade was 20 percent less than experienced over the first. Also, there were more registrations of insecticides and herbicides than for other pesticides, with insecticides having a slightly higher total than herbicides. Since 1985, however, the registration of insecticides has dropped off while the registration of herbicides has increased. This may reflect the shift in usage patterns between the two pesticide types.

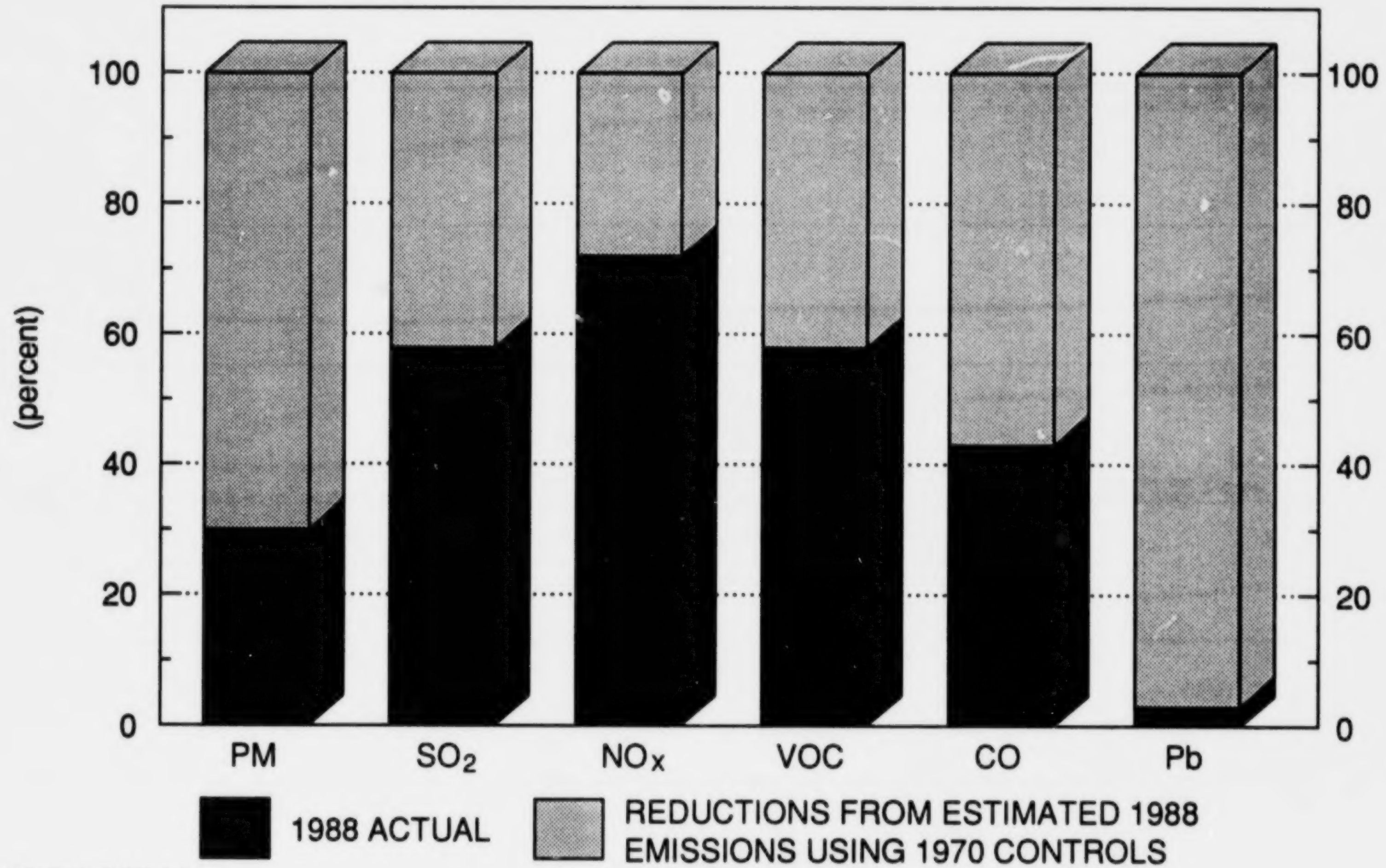
Figure 10-15 maps the presence of selected banned pesticides in human tissue over the period 1970-1983. The data show that some pesticides remain stored in human bodies, particularly in fatty tissue, long after their use has ceased.

Fig. 10-1: ACTUAL EMISSIONS AS A PERCENTAGE OF HYPOTHESIZED EMISSIONS AT THE 1970 LEVEL OF CONTROL



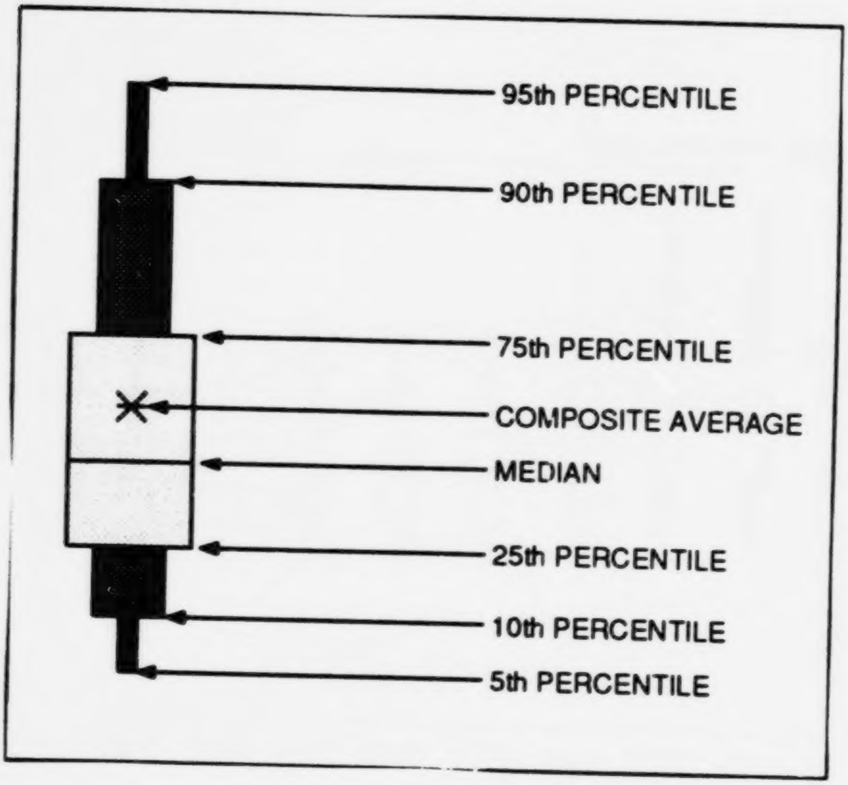
Source: Table 10-2

Fig. 10-2: ACTUAL 1988 EMISSIONS AS A PERCENTAGE OF ESTIMATED 1988 EMISSIONS AT THE 1970 LEVEL OF CONTROL



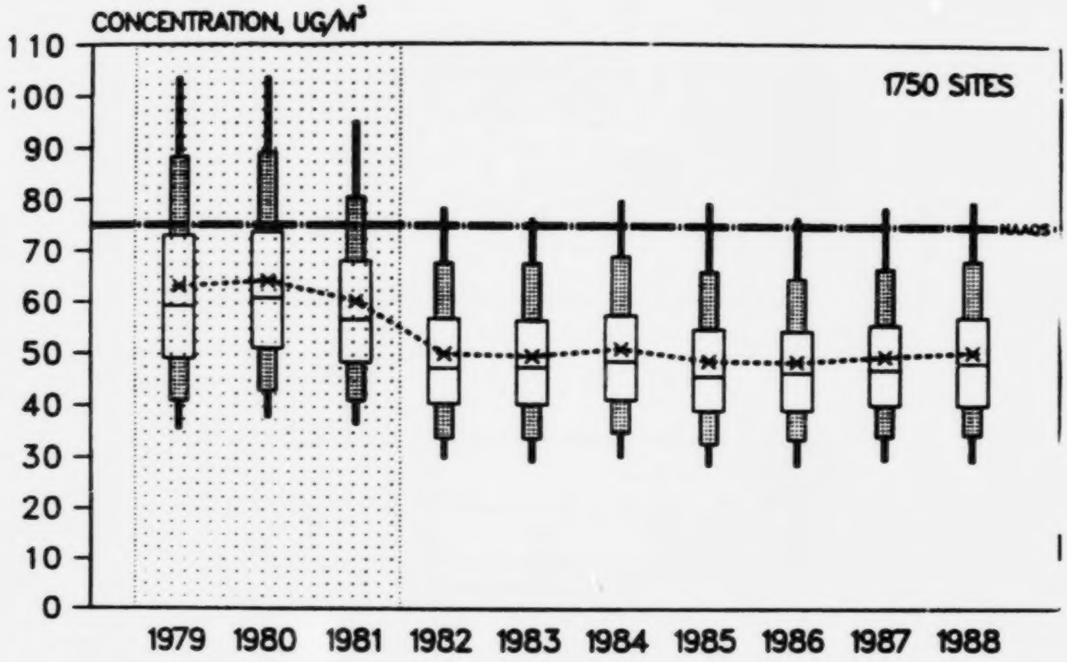
Source: Table 10-2

Fig. 10-3: ILLUSTRATIONS OF PLOTTING CONVENTIONS FOR BOXPLOTS


95th PERCENTILE
90th PERCENTILE
75th PERCENTILE
COMPOSITE AVERAGE
MEDIAN
25th PERCENTILE
10th PERCENTILE
5th PERCENTILE

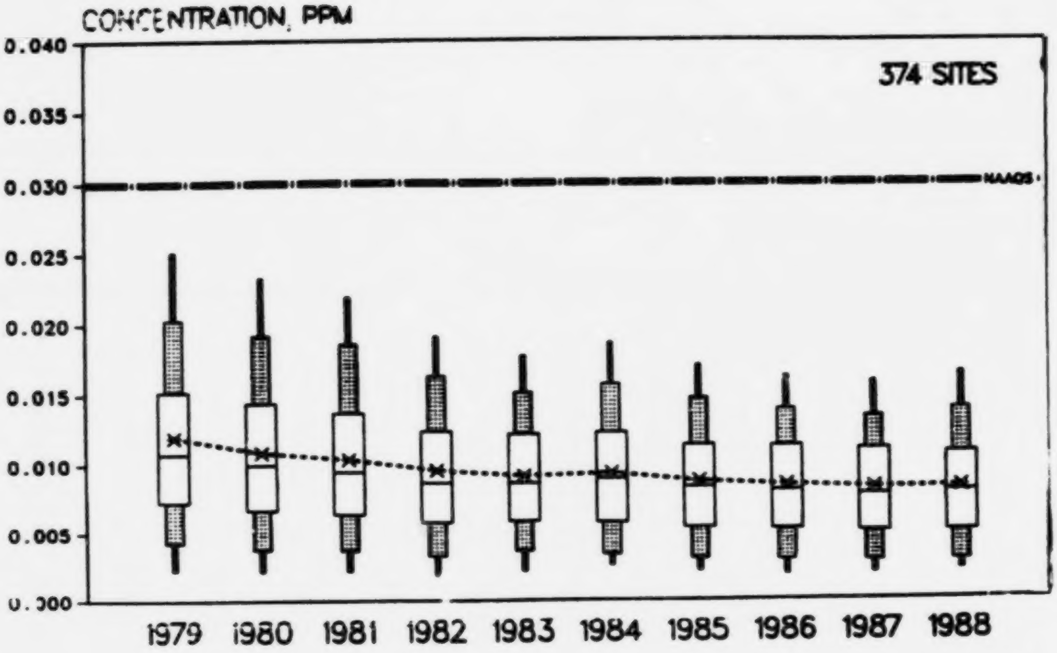
Source: U.S. EPA, *National Air Quality and Emissions Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

Fig. 10-4: ANNUAL GEOMETRIC MEAN TOTAL SUSPENDED PARTICULATE CONCENTRATIONS



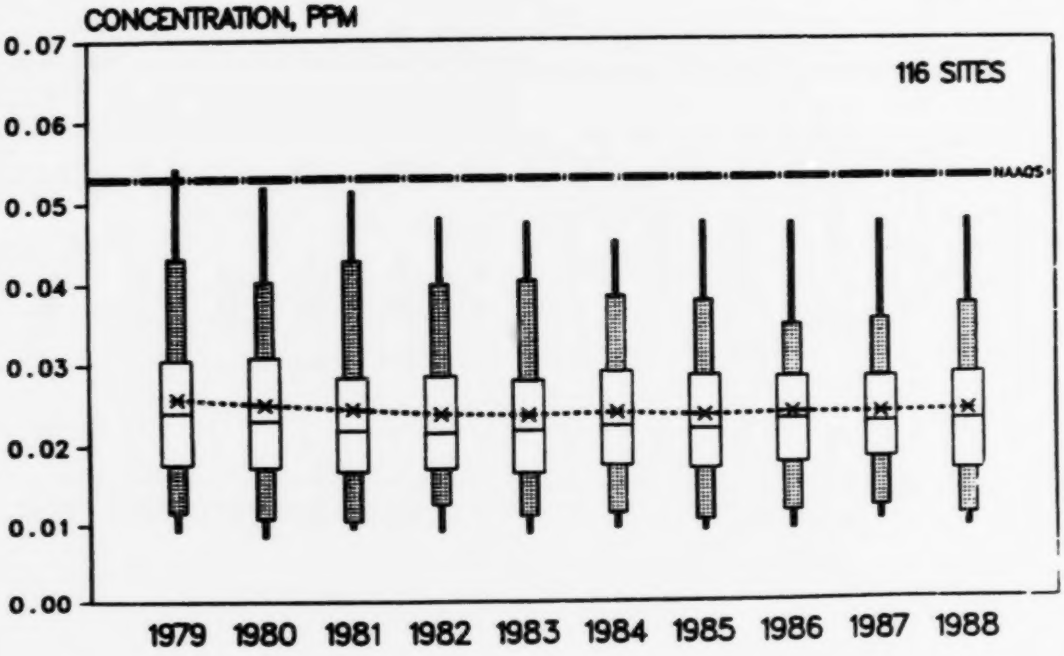
Source: U.S. EPA, *National Air Quality and Emissions Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

Fig. 10-5: ANNUAL MEAN SULFUR DIOXIDE CONCENTRATIONS



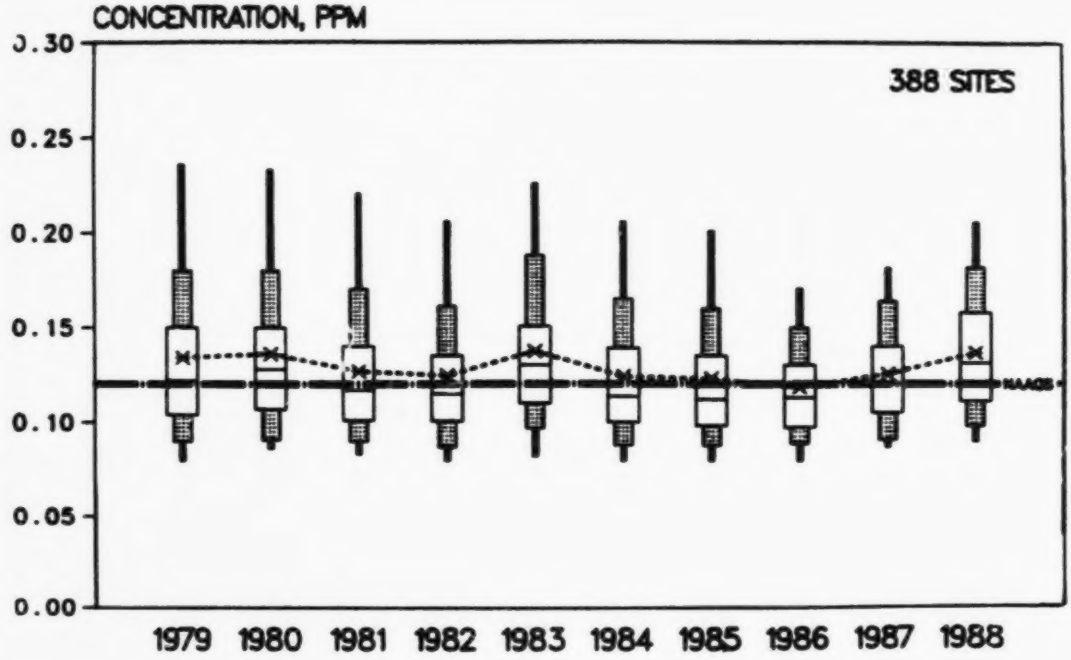
Source: U.S. EPA, *National Air Quality and Emissions Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

Fig. 10-6: ANNUAL MEAN NITROGEN DIOXIDE CONCENTRATIONS



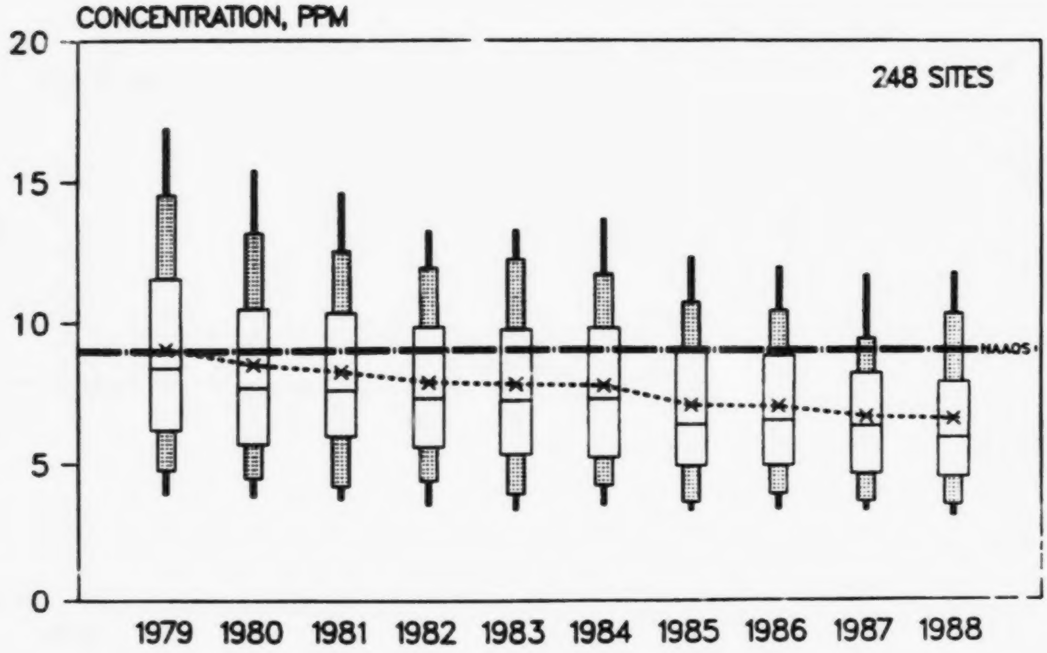
Source: U.S. EPA, *National Air Quality and Emissions Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

Fig. 10-7: ANNUAL SECOND-HIGHEST DAILY MAXIMUM 1-HOUR OZONE CONCENTRATIONS



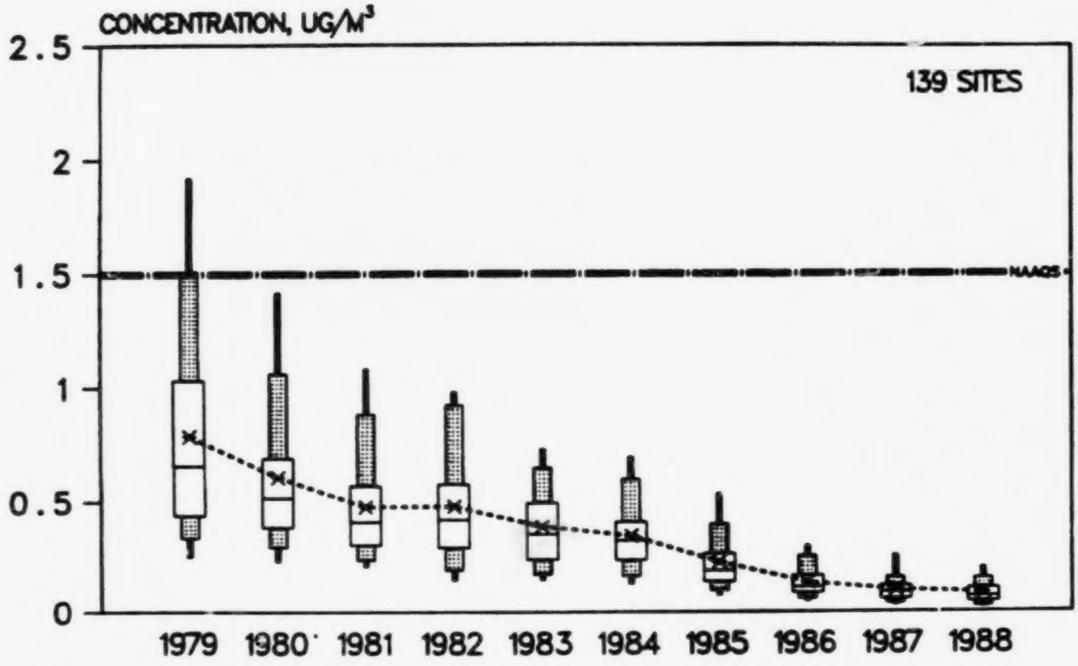
Source: U.S. EPA, *National Air Quality and Emissions Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

Fig. 10-8: ANNUAL SECOND-HIGHEST NONOVERLAPPING 8-HOUR AVERAGE CARBON MONOXIDE CONCENTRATIONS



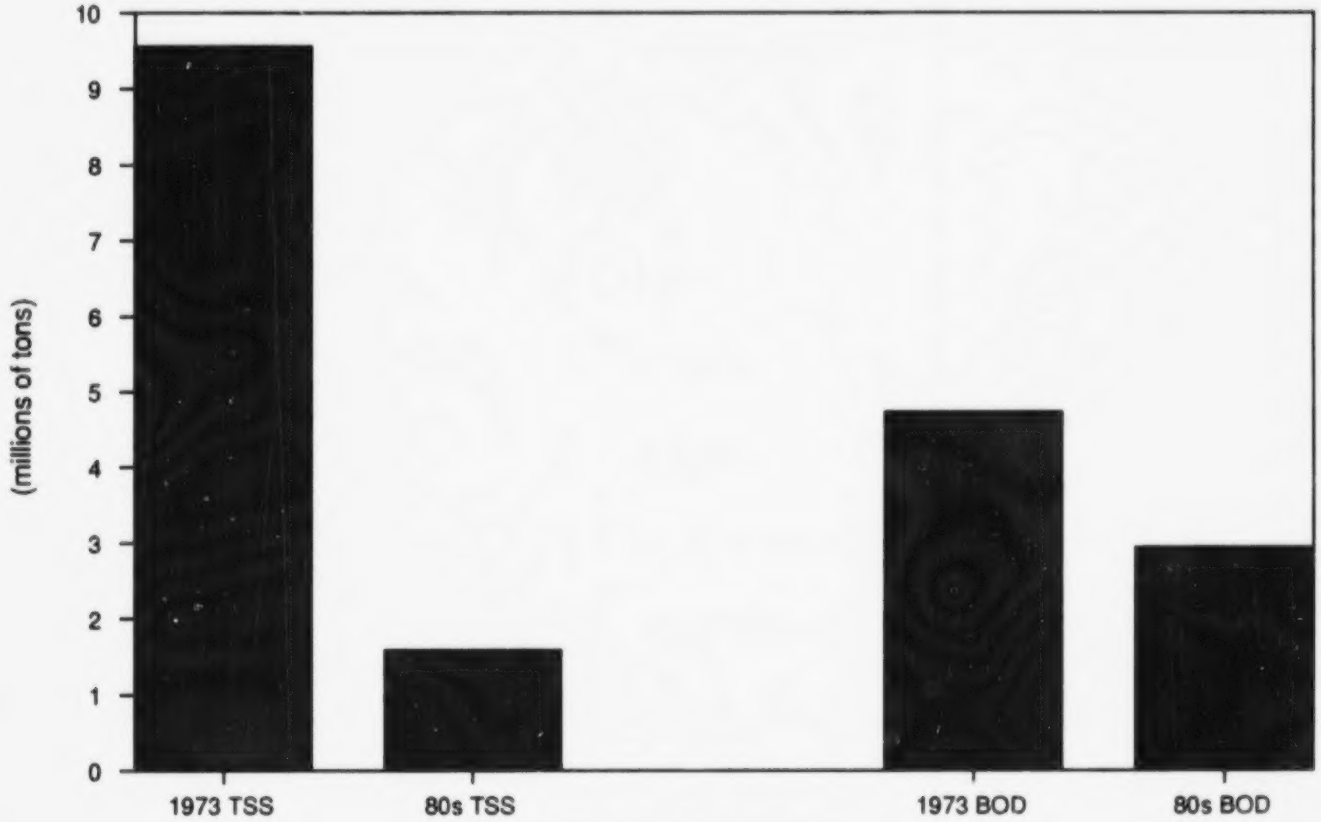
Source: U.S. EPA, *National Air Quality and Emissions Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

Fig. 10-9: ANNUAL MAXIMUM QUARTERLY AVERAGE LEAD CONCENTRATIONS



Source: U.S. EPA, *National Air Quality and Emissions Trends Report: 1988*, Office of Air Quality Planning and Standards, March 1990.

Fig. 10-10: MUNICIPAL AND INDUSTRIAL WATER DISCHARGES IN 1973 AND THE MID-1980S

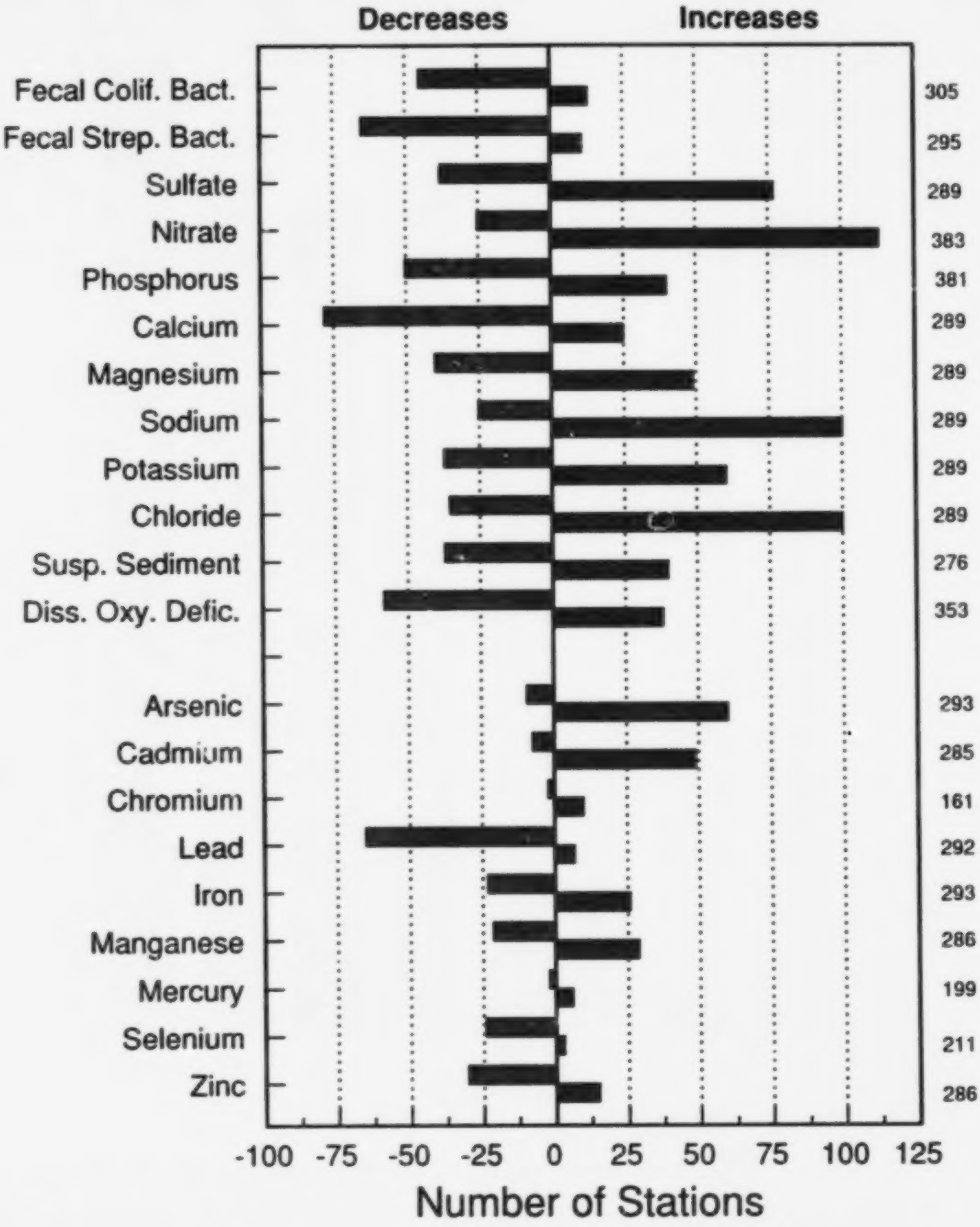


TSS is total suspended solids

BOD is biochemical oxygen demand

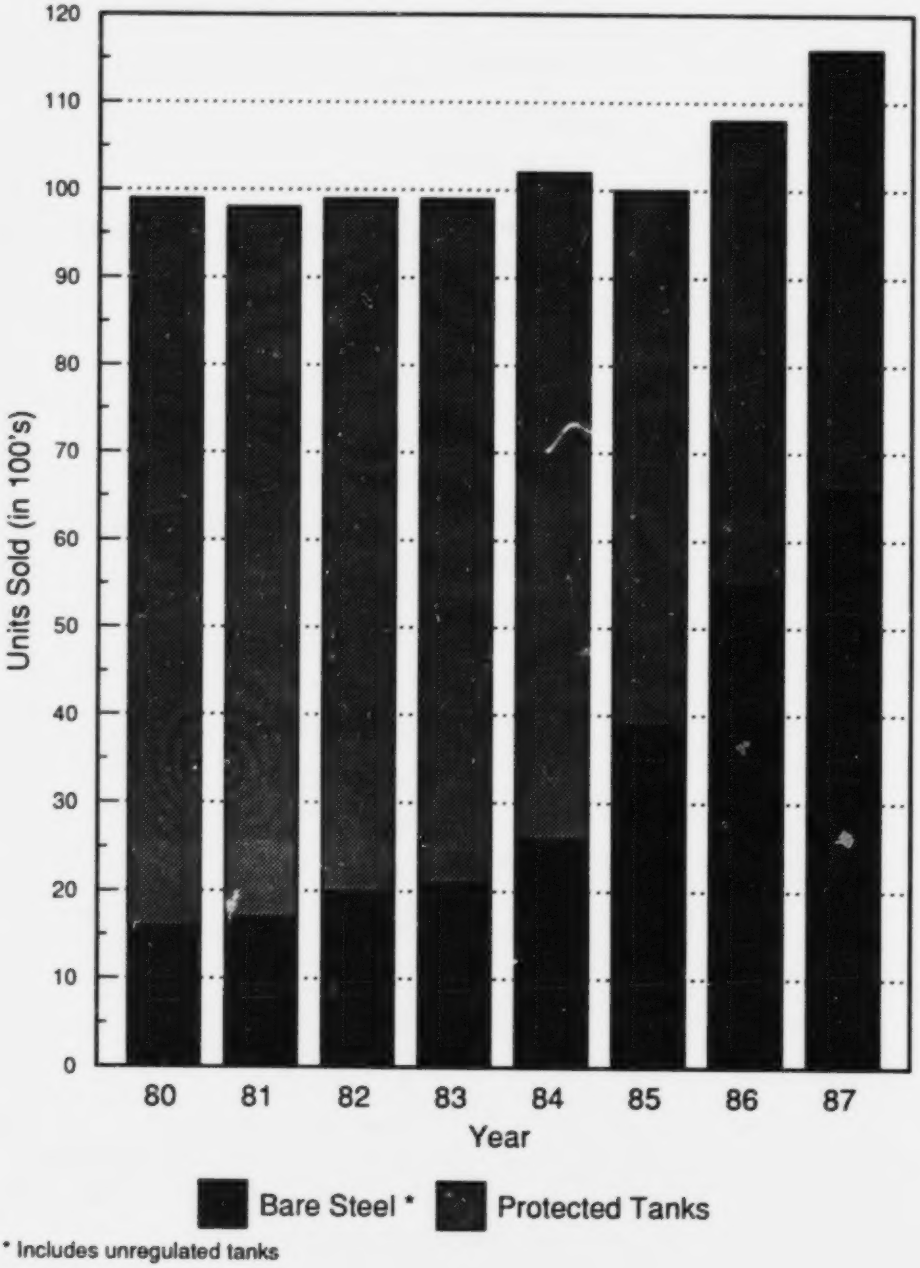
Source: Tables 10-3 and 10-4

Fig. 10-11: WATER QUALITY TRENDS, 1974-1981



Source: R. A. Smith *et. al.*, "Water Quality Trends in the Nation's Rivers", *Science* V. 235, March 1987.

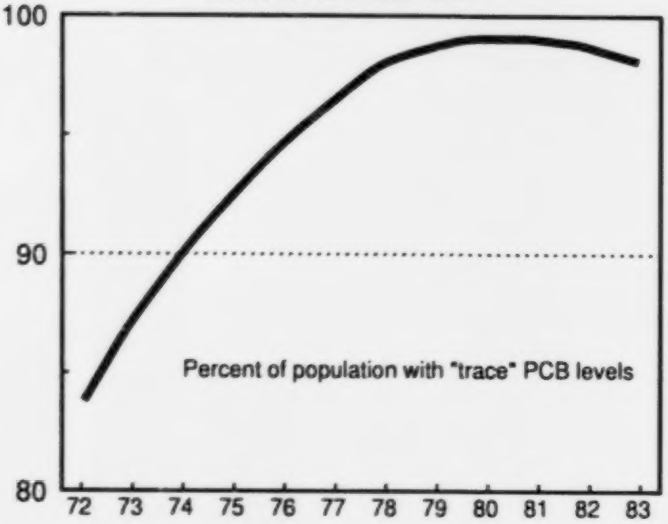
Fig. 10-12: STEEL TANK VERSUS PROTECTED TANK PRODUCTION, 1980-1987



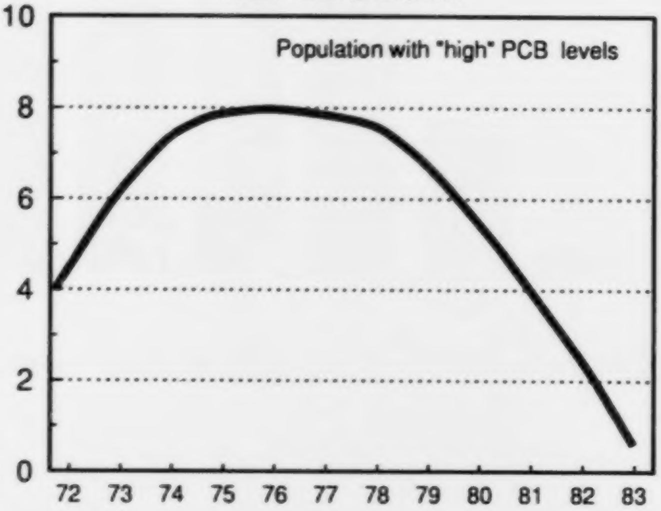
Source: Fiberglass Petroleum Tank and Pipe Institute, Technomics, STI registration files.

Fig. 10-13: PERSISTANCE OF PCBs IN HUMANS, 1972-1983

While Nearly Everyone Now Has "Trace" Levels of PCB's...

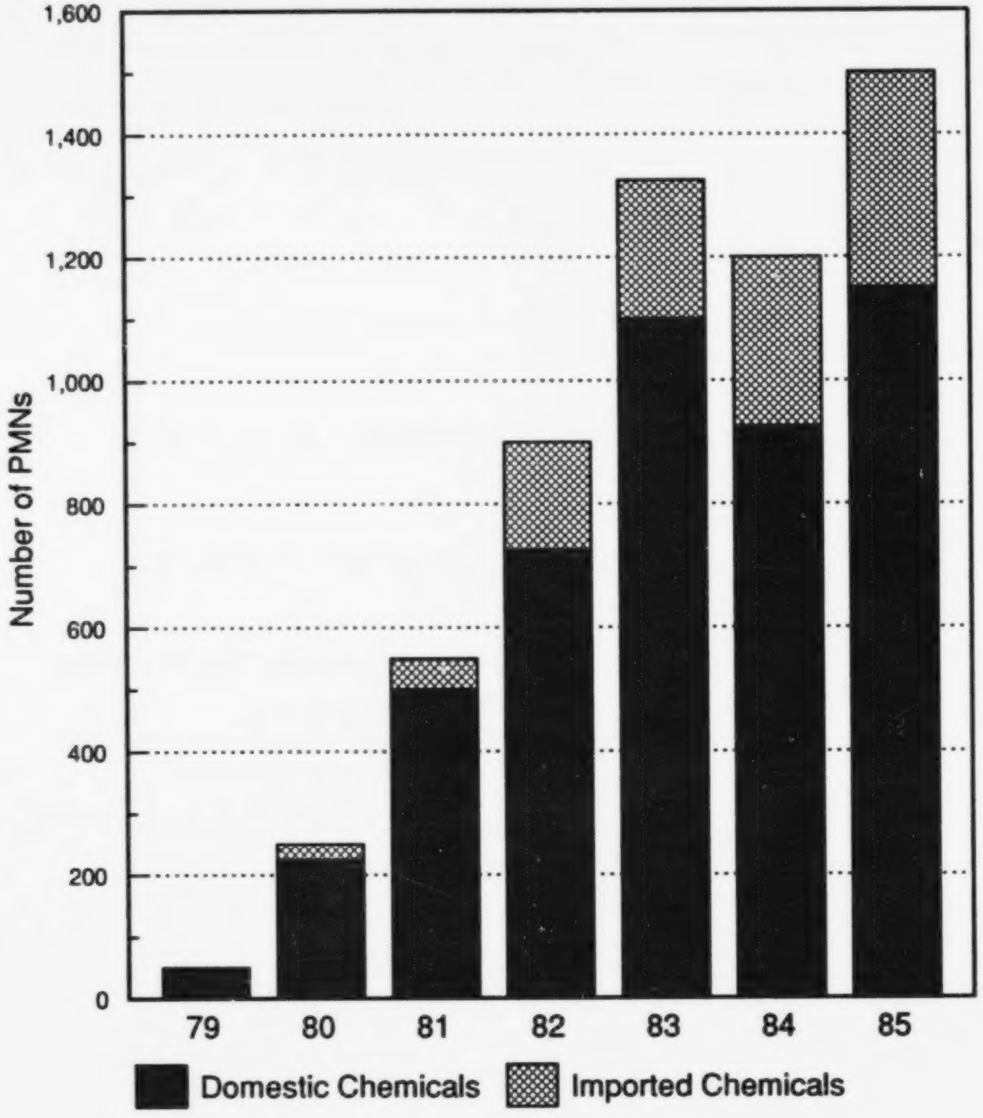


...The Percentage of Population with "High" Levels Has Gone Down



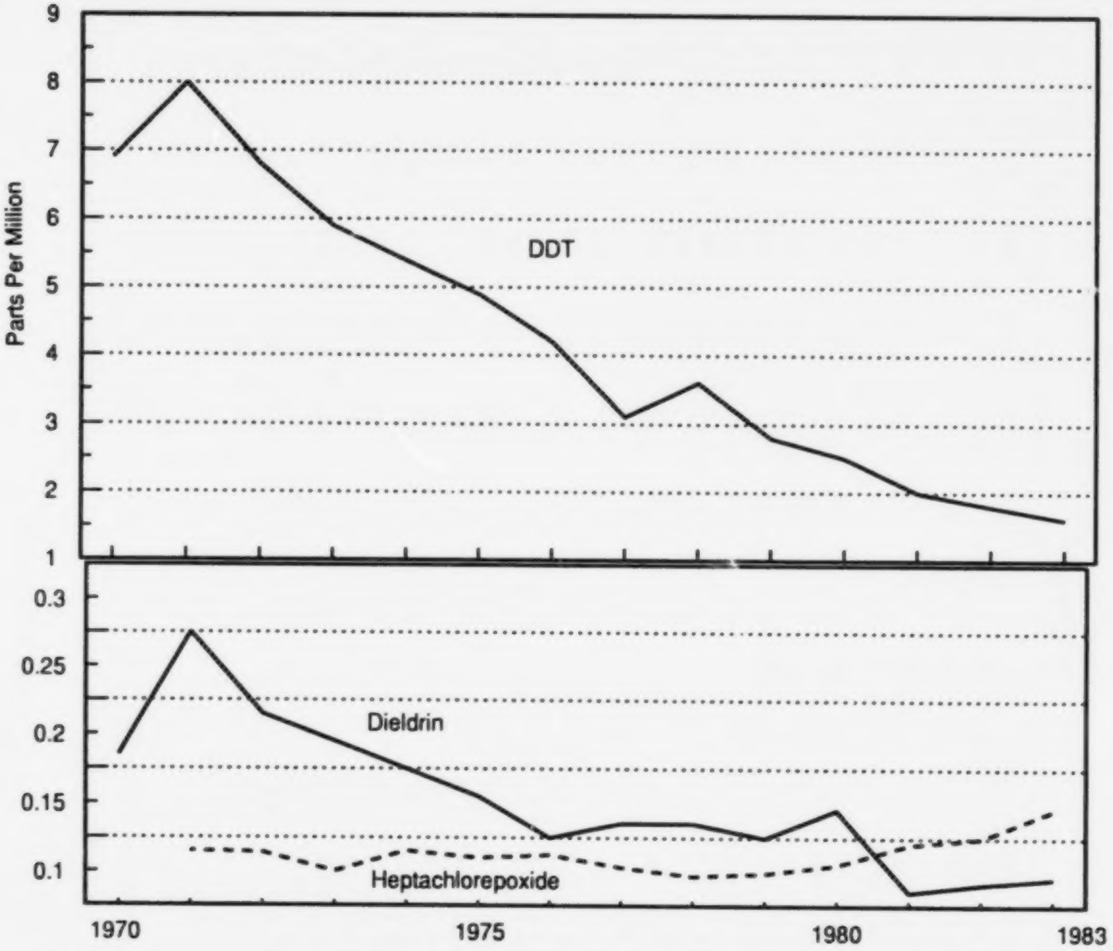
Source: U.S. EPA, *Environmental Progress and Challenges: EPA Update*, Office of Policy Planning and Evaluation, August 1988.

Fig. 10-14: TRENDS IN PRE-MANUFACTURE NOTICES (PMNS) FOR NEW CHEMICALS RECEIVED BY EPA, 1979-1985



Source: U.S. EPA, *Chemical Control in the United States: Accomplishments Under the New Chemicals Program*, Office of Toxic Substances, October 1986.

Fig. 10-15: CONCENTRATIONS OF SELECTED PESTICIDES IN HUMAN TISSUE IN THE U.S., 1970-1983



1972 - Most uses of DDT cancelled.

1974 - Most uses of Dieldrin cancelled.

1983 - Most uses of heptachlor cancelled or registrations denied.

Source: Reprinted from Conservation Foundation, *State of the Environment: A View Towards the 1990s*, 1987.

Table 10-1: NATIONAL AIR EMISSIONS ESTIMATES BY SOURCE CATEGORY FOR SELECTED YEARS 1940-1988

(teragrams)

Pollutant/Source Category	1940	1950	1960	1970	1975	1980	1983	1984	1985	1986	1987	1988
Particulates	23.1	24.9	21.6	18.5	10.6	8.5	7.1	7.4	7.1	6.8	7.0	6.9
Transportation	2.7	2.1	0.7	1.2	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4
Sta. Source/Fuel Combus.	7.5	7.0	5.7	4.6	2.8	2.4	2.0	2.1	1.8	1.8	1.8	1.7
Industrial Process	8.7	12.7	12.5	10.5	5.2	3.3	2.4	2.8	2.8	2.5	2.5	2.6
Solid Waste/Misc.	4.2	3.1	2.7	2.2	1.3	1.5	1.4	1.2	1.1	1.1	1.3	1.2
Sulfur Oxides	17.6	19.8	19.7	28.3	25.8	23.4	20.7	21.5	21.1	20.9	20.6	20.7
Transportation	2.9	2.3	0.4	0.6	0.7	0.9	0.8	0.8	0.9	0.9	0.9	0.9
Sta.Source/Fuel Combus.	11.0	12.9	14.0	21.3	20.2	18.7	16.7	17.4	17.0	16.9	16.6	16.4
Industrial Process	3.7	4.6	5.3	6.4	5.0	3.8	3.3	3.3	3.2	3.1	3.2	3.4
Solid Waste/Misc.	0.5	0.5	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nitrogen Oxides	6.9	9.4	13.0	18.5	19.5	20.9	19.3	19.8	19.8	19.0	19.3	19.8
Transportation	2.3	3.6	5.1	8.0	9.3	9.8	8.9	8.8	8.9	8.3	8.0	8.1
Sta. Source/Fuel Combus.	3.4	4.7	6.7	9.1	9.3	10.1	9.6	10.2	10.2	10.0	10.5	10.8
Industrial Process	0.2	0.3	0.5	0.7	0.7	0.7	0.5	0.6	0.6	0.6	0.6	0.6
Solid Waste/Misc.	1.0	0.8	0.7	0.7	0.2	0.3	0.3	0.3	0.2	0.2	0.2	0.3
Volatile Organic Compounds	15.2	18.1	21.0	25.0	21.1	21.1	19.3	20.3	19.1	18.3	18.6	18.6
Transportation	4.7	6.8	9.4	10.3	8.8	7.5	7.1	7.2	6.9	6.5	6.4	6.1
Sta. Source/Fuel Combus.	1.8	1.3	0.8	0.6	0.6	0.9	1.0	1.0	0.9	0.9	0.9	0.9
Industrial Process	3.3	5.4	6.3	8.9	8.3	9.2	7.9	8.8	8.5	8.1	8.3	8.5
Solid Waste/Misc.	5.4	4.6	4.5	5.1	3.4	3.5	3.3	3.3	2.8	2.8	3.0	3.0
Carbon Monoxide	82.6	87.6	89.7	101.4	84.1	79.6	74.5	71.8	67.0	63.1	64.1	61.2
Transportation	29.9	44.7	58.2	74.4	65.0	56.1	52.4	50.6	47.9	44.6	43.2	41.2
Sta. Source/Fuel Combus.	16.3	11.6	7.1	4.5	4.3	7.4	8.2	8.3	7.4	7.5	7.6	7.6
Industrial Process	6.6	10.5	9.3	8.9	6.9	6.3	4.3	4.7	4.4	4.3	4.5	4.7
Solid Waste/Misc.	29.8	20.8	15.1	13.6	7.9	9.8	9.6	8.2	7.3	6.7	8.8	7.7
Lead (10s of short tons/yr)	NA	NA	NA	203.8	147.0	70.6	46.4	40.1	21.1	8.6	8.0	7.6
Transportation				163.6	122.6	59.4	40.8	34.7	15.5	3.5	3.0	2.6
Sta. Source/Fuel Combus.				9.6	9.3	3.9	0.6	0.5	0.5	0.5	0.5	0.5
Industrial Process				23.9	10.3	3.6	2.4	2.3	2.3	1.9	1.9	2.0
Solid Waste/Misc.				6.7	4.8	3.7	2.6	2.6	2.8	2.7	2.6	2.5

Footnotes to Table 10-1

Note: To obtain tons/yr, divide number by 1.1 -- they are now in teragrams/yr. NA = Not Available

Source: U.S. EPA, ***National Air Pollutant Emission Estimates 1940-1988***, Office of Air Quality Planning and Standards, National Air Data Branch, March 1990, and other reports in this series 1984-1987.

Table 10-2: EFFECTS OF AIR POLLUTION CONTROLS ON 1984-1988 EMISSIONS

(millions of metric tons)

	1984	1985	1986	1987	1988
PM					
Actual Emissions	7.0	7.3	6.8	7.0	6.9
Estimated Emissions Using 1970 Level of Control	21.1	21.6	21.3	22.1	23.1
Actual Emissions as a Percent of Emissions Using 1970 Level of Control	33%	34%	32%	32%	30%
SO_2					
Actual Emissions	21.4	20.7	21.2	20.4	20.7
Estimated Emissions Using 1970 Level of Control	30.2	32.6	32.0	33.6	35.6
Actual Emissions as a Percent of Emissions Using 1970 Level of Control	71%	63%	66%	61%	58%
NO_x					
Actual Emissions	19.7	20.0	19.3	19.5	19.8
Estimated Emissions Using 1970 Level of Control	23.9	24.3	24.6	25.5	27.5
Actual Emissions as a Percent of Emissions Using 1970 Level of Control	82%	82%	78%	76%	72%
VOC					
Actual Emissions	21.5	21.3	19.5	19.6	18.6
Estimated Emissions Using 1970 Level of Control	36.0	35.8	35.7	34.9	32.2
Actual Emissions as a Percent of Emissions Using 1970 Level of Control	60%	59%	55%	56%	58%
CO					
Actual Emissions	69.9	67.5	60.9	61.4	61.2
Estimated Emissions Using 1970 Level of Control	124.6	125.7	127.4	136.4	142.0
Actual Emissions as a Percent of Emissions Using 1970 Level of Control	56%	54%	48%	45%	43%
Pb					
Actual Emissions	.040	.021	.009	.008	.007
Estimated Emissions Using 1970 Level of Control	.207	.223	.227	.230	.233
Actual Emissions as a Percent of Emissions Using 1970 Level of Control	19%	9%	4%	4%	3%

Footnotes to Table 10-2

Metric tons divided by 1.1 equals short tons.

Sources: U.S. EPA, ***National Air Pollutant Emission Estimates 1940-1988***, Office of Air Quality Planning and Standards, National Air Data Branch, March 1990, and other reports in this series 1984-1987.

Table 10-3: MUNICIPAL WASTE DISCHARGES IN SELECTED YEARS 1960-1988

(millions of tons)

Source No.	Year	Constituent Loadings TSS	Constituent Loadings BOD	Population Served(10^6)
3	1988	2.131	2.359	176
4	mid-80s	1.311	1.352	172(est)
5	1983	1.234	1.236	169
5	1980	1.161	1.163	159
6	1973	3.000	2.900	148(est)
7	1970	2.596	2.882	144
8	1963	2.169	2.398	120
5	1960	1.987	2.206	110

Footnotes to Table 10-3

TSS is total suspended solids.
BOD is biological oxygen demand.

For 1988 loadings calculations: Removed amounts were given; 76 and 80 percent removable rates were assumed for BOD and TSS respectively.

For 1980, 1983 calculations: Removal rates (76/BOD, 80/TSS) were given; raw loads 0.167 lbs. BOD/per/day and 0.2 lbs. SS/per/day were assumed.

For 1960, 1970 loadings calculations: for BOD, 0.167 lbs/per/day and 34 percent removal assumed; for TSS, assumed 0.2 lbs/per/day and 51 percent removal assumed.

Table 10-4: INDUSTRIAL WASTE DISCHARGES IN 1973 AND 1982-1987

(millions of tons)

	1973		1982-1987	
Industry	BOD	TSS	BOD	TSS
Pulp and Paper	0.949	1.117	0.091	0.150
Org. Chem., Plastics, & Synthetics	0.718	0.054	0.031	0.050
Petroleum Refining	0.057	0.015	0.006	0.012
Iron and Steel	0.020	1.283	—	0.023
Inorganic Chemicals	0.003	0.573	—	0.030
Textiles	0.063	0.055	0.004	0.009
Ore Mining and Dressing	—	3.444	—	0.011
Leather Tanning	0.020	0.022	—	—
Total	1.830	6.563	0.132	0.285

Footnotes for Table 10-4

TSS is total suspended solids.
BOD is biological oxygen demand.

Source: U.S. EPA, *Summary of Effluent Characteristics and Guidelines for Selected Industrial Point Source Categories*, Office of Water Regulations and Standards, October 1988, and R. A. Luken and E. H. Pechan, *Water Pollution Control: Assessing the Impacts and Costs of Environmental Standards*, Praeger Press, 1977.

Table 10-5: NON-POINT SOURCE DISCHARGES IN 1973 AND 1980

(millions of tons)

	1973				1980			
Source	BOD	SS	N	P	BOD	SS	N	P
NON-POINT SOURCE (NPS)								
Agriculture	8.57	1,799	4.26	1.49	14.00	3,090	6.80	2.64
Urban Runoff	1.66	0.03	0.64	0.09	0.50	20	0.39	0.09
Forest	NA	NA	2.70	0.04	0.80	256	0.15	0.02
Total Non-Point Source	10.23	1,800	7.63	1.63	15.3	3,366	7.34	2.75
POINT SOURCE (PS)								
Municipal	2.90*	3.00*	1.00	0.23	1.16*	1.16*	NA	NA
Industrial	1.83**	6.56**	NA	NA	0.13**	0.28**	NA	NA
Total Point Source	4.73	9.56	1.00	0.23	1.29	1.45	—	—
Total NPS + PS	14.96	1,809	8.63	1.86	16.59	3,367	7.34	2.75
Percent NPS (%)	68	99	88	88	92	99	—	—

Footnotes to Table 10-5

BOD is biological oxygen demand.
SS is suspended solids.
N is nitrogen.
P is phosphorus.

* from Table 10-3.
** from Table 10-4.
NA = Not Available.

Sources: 1973 data are from U.S. National Commission on Water Quality, *Public Law 92-500 Water Quality Analysis and Environmental Impact Assessment: Technical Report*, March 1976.

1980 data are from U.S. Council on Environmental Quality, *Environmental Quality*, Eighteenth Annual Report, 1987-88.

Table 10-6: RCRA HAZARDOUS WASTE GENERATION AND MANAGEMENT IN 1981 AND 1985

(millions of metric tons)

	1981	1985
RCRA-regulated Hazardous Waste Generated	264	272
Chemical & Petroleum (SIC 28,29)	71%	72%
Metal Related Industries (SIC 33-37)	22%	4%
Other Industries	7%	24%
Waste Management Facilities[a]	4818	2971
Treatment	1495	1597
Storage	4299	2585
Disposal	430	817
Recycling	**	846

Footnotes to Table 10-6

a Some facilities are counted more than once because they perform more than one waste handling function.

** Although no recycling facilities were specifically tabulated in 1981, 43 percent of generators surveyed indicated that they were recycling.

Sources: The 1981 data are from Westat, Inc., *National Survey of Hazardous Waste Generators and Treatment, Storage, and Disposal Facilities Regulated under RCRA in 1981*. Prepared for the U.S. EPA Office of Solid Waste, April 1984.

The 1985 data are from Research Triangle Institute, *1986 National Screening Survey of Hazardous Waste Treatment, Storage, Disposal, and Recycling Facilities*. Prepared for the U.S. EPA Office of Solid Waste, September 1988.

Table 10-7: HAZARDOUS WASTE HANDLED BY SELECTED COMMERCIAL FIRMS, 1983-1987

(thousands of metric tons)

	Year				
Disposal Technology	1983	1984	1985	1986	1987
Incineration	169	224	270	352	473
Resource Recovery	313	243	316	264	331
Landfill	1609	2082	2352	2306	2454
Chemical/Biological Treatment	989	1074	1133	950	1014
Solidification	66	76	NA	NA	NA
Deepwell Injection	727	476	416	273	268
Totals	3873	4175	4487	4145	4540

Footnotes to Table 10-7

NA = Not Available.

Source: ICF, Inc., *1986-1987 Survey of Selected Firms in the Commercial Hazardous Management Industry*. Prepared for the U.S. EPA Office of Policy Analysis, 1988.

Table 10-8: SELECTED EPA SUPERFUND ACTIONS, 1981-1988

(First-Starts)

	Year							
	1981	1982	1983	1984	1985	1986	1987	1988
Removals	28	60	129	208	196	175	254	220
Investigation Studies	21	32	112	127	129	37	127	93
Design Studies	5	4	7	16	19	26	70	69
Remedial Actions	0	9	9	16	8	12	35	51

Footnotes to Table 10-8

Source: U.S. EPA, *Progress Toward Implementing Superfund Fiscal Year 1987*, Office of Emergency and Remedial Response, April 1989, and a later report in this series dated March 1990.

Table 10-9: THE EXISTING UNDERGROUND STORAGE TANK WORLD

Type of Tank	Present Share of Population (%)	Estimated Number in Existence(10^3)[a]	Expected Future Growth Trend
Bare Steel	70-80	900-1,000	Rapid Decrease
Coated with CP[b]	8	100	Rapid Increase
FRP[c]	12-15	156-195	Moderate Increase
Composite Corrosion Resistant	5-8	65-100	Moderate Increase

Footnotes to Table 10-9

a. Based on EPA's estimate of 1,381,000 underground storage tank systems in existence.

b. CP= Cathodically protected plastic.

c. FRP = Fiberglass reinforced plastic.

Source: Jacobs Engineering Group, *Causes of Release from UST Systems*. Prepared for the U.S. EPA Office of Underground Storage Tanks, 1987.

Table 10-10: NEW GENERATION UNDERGROUND STORAGE TANK PRODUCTION, 1980-1987

Year	FRP[a]	Composite[b]	STIP3[c]
1980	9,000	NA	NA
1981	10,000	NA	NA
1982	11,000	NA	NA
1983	12,000	3,000	NA
1984	13,000	6,500	7,000
1985	14,000	8,000	14,000
1986	15,000	10,000	28,000
1987 (est.)	16,000	12,500	45,000

Footnotes to Table 10-10

FRP = Fiberglass reinforced plastic.
STIP3 = Externally plastic coated, cathodically protected.

a. Data from conversation with Ed Neshoff of the Fiberglass Reinforced Plastic Technology Institute.

b. Data from the Association of Clad Tankers.

c. Data from conversation with Wayne Geyer of the Steel Tank Institute.

NA = Not Available.

Table 10-11: U.S. PRODUCTION OF SELECTED CHEMICALS, 1960-1972

(millions of pounds)

	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972
Acrylonitrile	0.2292	0.2495	0.3601	0.4553	0.5942	0.7716	0.7161	0.6708	1.0210	1.1566	1.0393	0.9789	1.1147
Benzene	3.3430	3.9867	3.9442	4.7326	5.3380	6.0447	6.9830	7.0859	7.3110	8.6649	8.2860	7.8649	9.1554
Vinyl Chlorides	1.0370	1.0440	1.3115	1.4352	1.6150	2.000	2.4995	2.4236	2.9689	3.7359	4.0402	4.3358	5.0885
Pthalates	0.3447	0.3765	0.4700	0.5219	0.6014	0.6787	0.7545	0.7839	0.8406	0.8834	0.8551	0.9782	1.1457
PCBs	0.0379	0.0365	0.0384	0.0447	0.0508	0.0605	0.0658	0.0753	0.0753	0.0753	0.0753	0.0753	0.0753

Table 10-11A: U.S. PRODUCTION OF SELECTED CHEMICALS, 1973-1984

(millions of pounds)

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Acrylonitrile	1.3542	1.4117	1.2146	1.5178	1.646	1.7523	2.0178	1.8299	1.9964	2.0352	2.1462	2.2192
Benzene	10.6233	10.8792	7.4848	10.4184	10.4972	10.8772	12.2271	11.5836	9.7893	7.8119	N/A	N/A
Vinyl Chlorides	5.3511	5.6212	4.1963	5.6769	5.9859	6.9411	6.3888	3.4659	6.8736	4.9018	6.8754	6.0846
Pthalates	1.2031	1.2073	0.9038	1.0429	1.2024	1.2587	1.2910	1.0541	1.1198	0.9416	1.1466	1.1791
PCBs	0.0422	0.0411	0.0297	0.0296	0.0133	0	0	0	0	0	0	0

Footnotes to Tables 10-11 and 10-11A

Source: U.S. Council on Environmental Quality, *Environmental Trends*, Washington, D.C., 1981, as reproduced in Source 22.

U.S. Environmental Protection Agency, Interagency Testing Committee, unpublished data, 1986. Synthetic organic chemicals for phthalates, acrylonitrile, benzene, and vinyl chloride. Washington, D.C.

U.S. Environmental Protection Agency, 1976. Toxic Substances Control Act. (Pub. L. 94-469), Section 6. Regulation of hazardous chemicals and mixtures, (c) Polychlorinated biphenyls. Washington, D.C.

Table 10-12: U.S. CONVENTIONAL PESTICIDE USAGE, TOTAL AND ESTIMATED AGRICULTURAL SECTOR SHARE

(millions of pounds active ingredients)

Year	Total U.S.	Agricultural Sector	Agricultural Sector Shares (percent)
1964	540	320	59
1965	610	335	55
1966	680	350	51
1967	735	380	52
1968	835	470	56
1969	775	430	55
1970	740	430	58
1971	835	495	59
1972	875	525	60
1973	910	560	62
1974	950	590	62
1975	990	625	63
1976	1,030	660	64
1977	1,075	720	67
1978	1,110	780	70
1979	1,150	840	73
1980	1,175	846	72
1981	1,205	860	71
1982	1,100	880	80
1983	953	733	77
1984	1,080	850	79
1985	1,112	861	77
1986	1,096	820	75
1987	1,085	815	75
1988	1,130	845	75

Footnotes to Table 10-12

Note: Excludes wood preservatives, disinfectants, and sulfur.

Source: U.S. EPA, *Pesticide Industry Sales and Usage: 1988 Market Estimates*, Office of Pesticide Programs, December 1989.

Table 10-13: U.S. ANNUAL VOLUME OF PESTICIDE USAGE, BY TYPE, 1979-1988

(millions of pounds of active ingredients)

Pesticide Type	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Herbicide	560	555	570	544	575	675	670	655	645	660
Insecticide	378	395	405	391	255	270	300	295	260	268
Fungicide	106	120	123	119	68	80	82	86	122	132
Other	106	105	107	106	55	55	60	60	60	70
Total	1,150	1,175	1,205	1,160	953	1,080	1,112	1,096	1,087	1,130

Footnote to Table 10-13

Source: Source: U.S. EPA, *Pesticide Industry Sales and Usage: 1988 Market Estimates*, Office of Pesticide Programs, December 1989.

Table 10-14: NUMBER OF CHEMICALS REGISTERED FOR THE FIRST TIME UNDER FIFRA, BY TYPE, 1967-1988

Year	Insecticide	Herbicide	Fungicide	Bactericide/ Slimicide	Nematicide	Rodenticide	Other	Total Uses Registered	Total Chemicals Registered
1967	4	2	2	5	0	2	1	16	16
1968	6	2	5	4	0	0	1	18	18
1969	7	4	0	2	0	0	1	14	14
1970	1	2	2	3	0	0	2	10	10
1971	0	1	1	1	0	1	1	5	4
1972	4	5	6	5	0	0	1	21	21
1973	5	2	4	2	1	0	0	15	13
1974	6	8	6	0	1	1	0	22	22
1975	8	11	5	11	0	0	1	36	35
1976	2	3	2	4	0	0	1	12	12
1977	1	1	0	1	0	0	0	3	3
1978	2	2	0	0	0	0	1	5	5
1979	8	2	4	0	0	1	2	17	17
1980	4	3	1	0	0	2	1	11	11
1981	4	3	2	1	0	0	6	16	16
1982	5	5	1	1	0	2	3	17	17
1983	5	5	3	1	0	0	0	14	14
1984	6	1	2	2	0	1	2	14	13
1985	8	1	1	1	0	0	2	13	10
1986	2	7	0	0	1	0	2	12	11
1987	3	5	0	1	1	0	2	12	11
1988	2	5	1	0	1	0	2	11	11

Footnotes to Table 10-14

Source: U.S. EPA, *Pesticide Industry Sales and Usage: 1988 Market Estimates*, Office of Pesticide Programs, December 1989.

APPENDIX A
ESTIMATION OF COSTS FOR NEW AND FORTHCOMING REGULATIONS

Cost estimates are included in this report for the individual regulations and programs listed in Table 2-3. This appendix lists the following information for each of these:

(a) Current rulemaking status and expected proposal or finalization date;
(b) Particular regulatory option for which costs were estimated if the regulation is not yet final;
(c) Data sources from which the basic cost estimates were derived; and
(d) Summary of the derivation of the cost estimates from the raw data and assumptions used to apportion costs over time.

The regulation summaries are categorized below according to environmental medium. The categories are numbered to correspond with the chapters and sections in the main text in which the regulations are discussed. A brief discussion of regulations for which cost estimates are not included in this report is included at the end of each media section. Estimates of capital and O&M expenditures over the period 1986-2000 for each of the included regulations are given in the tables following the regulation summaries.

3. AIR AND RADIATION REGULATIONS

3.1. Air

3.1.1. Stationary Source

Particulate Matter National Ambient Air Quality Standard (Revision)

(a) Status: Final rule (52 FR 24634; July 1, 1987).

(b) Regulatory option: See 52 FR 24634.

(c) Data sources:

(1) *Regulatory Impact Analysis on the National Ambient Air Quality Standards for Particulate Matter*, Second Addendum, US EPA Office of Air Quality Planning and Standards, December, 1986.

(2) *Regulatory Impact Analysis on the National Ambient Air Quality Standards for Particulate Matter*, US EPA Office of Air Quality Planning and Standards, February 21, 1984.

(d) Derivation and timing of estimates: Table 4 of Data Source 1 (no page number given) provides a 1983 present value estimate (calculated using a discount rate of 10 percent) for incremental costs of the rule. We converted this into a 1989 present value (using the single payment present worth factor associated with a 10 percent rate over six years), and then re-annualized this estimate over 15 years. Data Source 1 did not provide sufficient information to enable us to dissagregate this annualized cost estimate into fixed and variable cost components. However, Data Source 2 provides information on the relationship between capital and annualized costs for a similar regulatory option. Although the costs estimates from Data Source 2 cannot be used directly because they are outdated, we used the ratio of capital to annualized costs provided by this source to dissaggregate the annualized cost estimate derived from Data Source 1 into fixed and variable cost components. We assumed that capital costs would be incurred in equal increments over the years 1987-1989. O&M costs were assumed to phase-in with each increment of capital with a one year lag.

Lead National Ambient Air Quality Standard (Revision)

(a) Status: Expected proposal date: October 1990.

(b) Regulatory option: 0.5 ug/m^3, averaged quarterly.

(c) Data source: *Costs Assessment of Regulatory Alternatives for Lead NAAQS*, U.S. EPA Office of Air Quality Planning and Standards, July 1985.

(d) Derivation and timing of estimates: Table 2 (no page number given) of the data source reports capital and annualized costs for the 0.5 ug/m^3 regulatory option. The data source also reports that annualized costs were calculated by amortizing capital costs at the rate of 10 percent over 15 years. This information and the capital and annualized costs data were used to back-out annual O&M costs. We assumed that the rule would be promulgated in 1991 and go into effect in 1993. Capital costs were divided into three equal increments and placed in years 1991, 1992, and 1993. The O&M costs were assumed to phase-in with each increment of capital expenditure after a one-year lag.

Acid Rain Control

(a) Status: These costs reflect the Administration's proposed strategy for controlling stationary source SO_x and NO_x set out in Tile V of H.R. 3030 and S. 1490 (101st Congress, 1st Session) which would amend the Clean Air Act.

(b) Regulatory option considered: The costs reflect the high baseline assumption about future emissions and are associated with annual reductions of 4.1 million tons of SO2 below 1980 levels in Phase I (1996-2000) and 8.2 million tons in Phase II (2001-2004). The costs also reflect the constrained implementation scenario which assumes that emissions trading will be utilized on an intra-utility basis in Phase II only.

(c) Data source: *Economic Analysis of Title V (Acid Rain Provisions) of the Administration's Proposed Clean Air Act Amendments (H.R. 3030/S. 1490)*, Prepared for the US EPA by ICF Resources, Inc., September 1989.

(d) Derivation and timing of estimates: Data Source 1 (p. 14) reports year 1996 (Phase I) and year 2001 (Phase II) annualized costs. The Phase I requirements would become effective after December 31, 1995. The Phase I annualized cost estimate was thus used to show costs for years 1996 through 1999. We assumed that in year 1995 fifty percent of the Phase I annualized costs would be incurred as utilities geared up to meet the Phase I requirements. Also, we assumed that costs in year 2000 would be fifty percent greater than the Phase I annualized costs to reflect preparation by utilities to meet the Phase II requirements which begin in year 2001. Since the annualized costs could not be dissaggregated into fixed and variable cost components, no capital costs were reported, and the annualized cost estimates are reported under the O&M cost category starting in year 1995.

Toxic Substances Control (Stationary and Area Sources)

(a) Status: These costs reflect the Administration's strategy for controlling toxic air pollutants set out in Title III of H.R. 3030 and S. 1490 (101st Congress, 1st Session), which would amend the Clean Air Act.

(b) Regulatory option: The Title III strategy inlcudes a two-pronged control approach mandating technology-based standards for all source categories, and additional health-based standards for those source categories deemed to present unreasonable human health risks even after compliance with the technology-based standards. Only the former is costed here.

(c) Data source: *Analysis of Costs of Hazardous Air Pollutant Controls Under Administration Bill, H.R. 2585, and S. 816*, Prepared for the US EPA Office of Air Quality Planning and Standards by Energy and Environmental Analysis, Inc., October 27, 1989.

(d) Derivation and timing of estimates: The data source (p. 2-3) reports an annualized cost range for stationary and area source compliance with the technology- based standards in year 2003 (the year in which costs would be fully realized). We took the midpoint of the estimated year 2003 cost range and used it to derive annual costs according to the methodology discussed below. Title III sets out a schedule for the promulgation of the technology-based standards which requires that standards for ten source categories be promulgated within two years after enactment of the law, standards for 25 percent of source categories within four years, 50 percent of source categories within seven years, and a decision on final promulgation for the remaining source categories within seven years. We assumed that the law would be enacted in 1990, and that the percentage of source categories affected by each particular source category standard would correspond equally with the percentage of the year 2003 annualized cost incurred as a result of that standard. Title III also specifies that existing sources will have three years to comply with their relevant standards. Using this information, we further assumed that the annualized costs for any particular standard would increase steadily over the three years following promulgation, reaching a peak in the third year and continuing at this annual level into the future. Using this methodolgy, we calculated that 3.33 percent of the year 2003 annualized cost would be incurred in year 1993, 6.66 percent in 1994, 15 percent in 1995, 20 percent in 1996, 25 percent in 1997, 33.33 in 1998, 41.66 percent in 1999, and 50 percent in year 2000. We did not have enough information to dissaggregate the annualized cost estimates into fixed and variable costs components; thus, the annualized cost estimates were used and reported under the O&M cost category.

Ozone National Ambient Air Quality Standard: Full Attainment (Stationary Sources)

(a) Status: These costs reflect the Administration's strategy for ozone NAAQS attainment set out in Title I of H.R. 3030 (101st Congress, 1st Session), which would amend the Clean Air Act.

(b) Regulatory option: The various stationary source VOC control measures for which cost data were collected include: 1) hazardous waste TSDF, 2) municipal landfills, 3) consumer and commercial use of solvents, 4) marine vessels, 5) new CTG, and 6) progress requirements. This last provision would require non-attainment areas to achieve a 15 percent reduction from 1990 baseline emissions within five years and, in each subsequent year, either attain or reduce emissions by an additional three percent. This requirement would involve certain additional controls that are identifiable at this time, as well as additonal controls that are yet unknown. These additional measures would involve both stationary and mobile sources.

(c) Data source: *Ozone Nonattainment: A Comparison of Bills*, Prepared for the US EPA Office of Air and Radiation by E.H. Pechan & Associates, Inc., January 1990.

(d) Derivation and timing of estimates: Tables 3 and 4 of the data source (pp. 6 & 7) provide annualized costs for each control measure for the years 1995 and 2000. For each control measure, we subtracted the year 1995 cost estimate from the year 2000 cost estimate, and divided the result by five to figure the average annual increase in costs throughout the period 1995-2000. These average annual increases in costs were then used to figure costs for each year throughout the period 1993-2000 for each control measure (For the "progress requirements" measure, the average annual increase in cost was used to figure costs for the years 1995-2000 only; year 1993 and 1994 costs were assumed to be at the level of 1995 costs). The year 1993 was assumed to be the first year in which costs would be incurred. Since the annualized costs could not be dissaggregated into fixed and variable cost components, the annualized cost estimates were reported under the O&M cost category. These annualized costs were calculated by the data source using a 10 percent rate of capital amortization.

Stratospheric Ozone Protection Plan

(a) Status: Final rule (53 FR 30566; August 12, 1988).

(b) Regulatory option: See 53 FR 30566.

(c) Data sources:

(1) *Regulatory Impact Analysis: Protection of Stratospheric Ozone Depletion, Volumes I and II*, US EPA Office of Air and Radiation, December 1987.

(2) Profile of the regulation prepared by Stephen Seidel (Office of Policy Planning and Evaluation, Global Change Division) for the EPA Sector Study.

(d) Derivation and timing of estimates: Data Source 2 provides undiscounted *social cost* estimates derived using welfare analysis for each of the years 1989-1995, and year 2000 (these costs are associated with the moderate stretch-out scenario). Page 9-13 of the RIA (data source 1) provides present value cost estimates (calculated with a 2 percent discount rate) for the period 1989- 2000. The following assumptions were used together with the above data to derive undiscounted cost estimates over years 1996-1999, for which annual social costs data were missing. Data Source 2 indicates that the first big increase in social costs occurs in year 1994 following the rule's 20 percent CFC reduction requirement in 1993. Data Source 2 also indicates that social costs increase annually by only 6 percent over the period 1994-1996. We assumed that 1997 and 1998 social costs would also be 6 percent higher than the previous years' estimates, respectively. The rule requires a 50 percent CFCs reduction in year 1998, which implies that social costs will make a large jump in year 1999. To derive undiscounted social costs for year 1999, we took the RIA estimate of present value social costs for the period 1989-2000 (p. 9-13), and subtracted from it the present value (at 2 percent) of our supplied and derived estimates for years 1989-1998, and year 2000. The annual estimates are reported under the O&M costs category (no numbers are reported under the capital cost category).

3.1.2. Mobil Sources

Fuel Volatility Rule

(a) Status: Final rule (54 FR 11868; March 22, 1989).

(b) Regulatory option: See 54 FR 11868.

(c) Data sources: See Appendix C.

(d) Derivation and timing of estimates: See Appendix C.

NOx and Particulates Standards for Light-Duty Trucks and Heavy-Duty Engines

(a) Status: Final rule (50 FR 10606: March 15, 1985).

(b) Regulatory option: See 50 FR 10606.

(c) Data sources: See Appendix C.

(d) Derivation and timing of estimates: See Appendix C.

Diesel Fuel Quality Standards

(a) Status: Final rule (54 FR 11868; March 22, 1989).

(b) Regulatory option: See 54 FR 11868.

(c) Data sources: See Appendix C.

(d) Derivation and timing of estimates: See Appendix C.

Toxic Substances Control (Mobile Sources)

(a) Status: These provisions are part of the Administration's strategy for controlling hazardous air pollutants which are set out in Title III of H.R. 3030 and S. 1490 (101st Congress, 1st Session).

(b) Regulatory option: See Appendix C.

(c) Data sources: See Appendix C.

(d) Derivation and timing of estimates: See Appendix C.

Ozone National Ambient Air Quality Standard: Full Attainment (Mobile Sources)

(a) Status: These provisions reflect the Adminsistration's strategy for ozone NAAQS attainment set out in H.R. 3030 (101st Congress, 1st Session), which would amend the Clean Air Act.

(b) Regulatory option: See Appendix C.

(c) Data sources: See Appendix C.

(d) Derivation and timing of estimates: See Appendix C.

Air regulations not included in the data set.

Potential rules which were deemed too speculative at this time to include in the report or for which adequate cost data were not available include various NAAQS revisions (*e.g.*, fine particulates). Several new and forthcoming rules involving New Source Performance Standards (NSPS) were also excluded from the cost data set because adequate cost data was not available. These include various NSPS for synthetic organic chemical manufacturing industries, commercial steam generators, small boilers, and residential wood heaters. Forthcoming mobile source rules for which adequate cost data could not be obtained include cold-start carbon monoxide standards, and on-board diagnostic systems for emission controls.

3.2. Radiation Regulations

Radon Advisory

See Appendix G

4. WATER REGULATIONS

4.1. Water Quality

Treatment of Municipal Wastewater: Full Compliance

(a) Status: Established Program (40 CFR Part 35).

(b) Regulatory Option: The cost estimates provided for this program include the net costs (i.e. costs over and above expected future expenditures for wastewater treatment during the period 1990-2000) of bringing existing facilities into compliance with their permits as well as the costs of design needs for the year 2000. The costs reflect the following components of needs, some of which are Federal grant-eligible and some of which are not: 1) secondary treatment, 2) advanced treatment, 3) infiltration, including inflow and replacement, 4) new collector sewers and interceptors, and 5) combined sewer overflow.

(c) Data sources:

(1) *1988 Needs Survey Report to Congress: Assessment of Needed Publicly Owned Wastewater Treatment Facilities in the US*, US EPA Office of Municipal Pollution Control, EPA 430/09-89-001, February 1989.

(2) *State Revolving Fund Report to Congress: Financial Status and Operations of Water Pollution Control Revolving Funds*, Draft Report, US EPA Office of Municipal Water Pollution Control, February 1990.

(d) Derivation and timing of estimates: Data Source 1 reports one capital cost estimate (p. 8) representing the costs required to meet the total current needs of existing facilities with documented water quality or public health problems. This estimate was divided into 11 equal increments, and one increment attributed to each of the years 1990-2000. Data Source 1 reports another capital cost estimate (p. 8) representing the total capital needs for population growth over the period 1988-2008. This estimate was divided into 21 equal increments and one increment attributed to each year within this period. The two sets of capital cost estimates for each of the years 1990-2000 were then summed to calculate *total* "full compliance" capital needs in the amount of $6561 million for each year over this period. One final step was then used to derive *net* full compliance capital needs (i.e. capital needs over and above expected capital expenditures for municipal wastewater treatment) for the period 1990-2000. To derive net capital needs, combined projections for future wastewater treatment expenditures by EPA, state and local governments were subtracted from the total full compliance capital costs for each year within the period 1990-2000. This added step was required because the cost projections for future wastewater expenditures, which are based on recent trends in expenditures reported by national surveys, should incorporate a portion of the "full compliance" capital needs. This added step was thus required to isolate the costs for that portion of full compliance capital needs that are not expected to be met during the period 1990-2000. Costs estimates for full compliance O&M costs are based on information from Data Source 2 indicating that annual O&M costs are about one-tenth of capital costs for the average facility. Full compliance O&M costs were calculated as one-tenth of the annual net full compliance capital costs derived using the procedure discussed above.

Pretreatment Requirements

(a) Status: Final (40 CFR Part 403).

(b) Regulatory option: See 40 CFR Part 403.

(c) Data sources:

(1) Sector Study municipal cost data base developed by Brett Snyder (Office of Policy Analysis) with assistance from Denise Scott (Office of Water Enforcement and Permits, Permits Division).

(2) "Pretreatment Audit Summary System" (PASS).

(d) Derivation and timing of estimates: The cost estimates are based on data contained in "PASS" (Data Source 2) which shows annual budget and FTE expenses for pretreatment programs in those cities that have implemented such programs. These costs were treated as annual recurring costs. Data Source 1 derived total pretreatment costs for all cities by extrapolating the cost data to cities within specific city size categories that have not yet implemented the program. We aggregated the costs provided by Data Source 1 accross all city size categories to calculate national costs of the rule. We assumed that all cities have implemented or will implement pretreatment programs from 1988 and

1991; one-fourth of total annual costs were placed in year 1988, one-half in year 1989, three-fourths in 1990 and total annual costs in each of the years 1991-2000.

Sewage Sludge Use and Disposal—Technical Requirements

(a) Status: Proposed rule (54 FR 5646; February 6, 1989). Expected finalization date: October 1991.

(b) Regulatory option: This rule will establish technical standards setting allowable concentrations of pollutants in sewage sludge for each allowable sludge use and disposal method. The cost estimates are based on regulatory alternative 3, which would regulate critical sites based on Maximum Exposed Individuals.

(c) Data sources:

(1) Sector Study municipal cost data base developed by Brett Snyder (Office of Policy Analysis).

(2) *Draft Regulatory Impact Analysis of the Proposed Regulations for Sewage Sludge Use and Disposal*, Prepared for the US EPA by Eastern Research Group, Inc, July 1987.

(3) Memorandum from Debra Nicoll (Office of Municipal Pollution Control, Analysis and Evaluation Division) to Brett Snyder listing the revised RIA capital and O&M cost data for the technical regulatory option 3, dated January 13, 1988.

(d) Derivation and timing of estimates: The cost estimates were derived from data contained in Data Source 3, which provides capital and O&M costs for five different disposal methods associated with regulatory option 3, as well as the number of plants expected to use each disposal method. This data was used to develop regulatory costs for different city size categories, which are reported by Data Source 1. We aggregated the costs across city size categories to calculate total national capital and O&M costs. We assumed the rule would become effective in 1992, and all capital costs would be incurred in that year. O&M costs were assumed to begin in the following year.

Stormwater Management NPDES Application Requirements

(a) Status: Proposed rule (53 FR 49416; December 7, 1988). Expected finalization date: 1990.

(b) Regulatory option: The rule would establish stormwater permit application requirements for stormwater discharges from large- and medium-sized municipal stormwater systems.

(c) Data source: Sector Study municipal cost data base developed by Brett Snyder (Office of Policy Analysis) based on data from Jim Gallop (Office of Water Enforcement and Permits, Permits Division).

(d) Derivation and timing of estimates: The costs reflect one-time costs to municipalities with populations over 100 persons for developing and implementing stormwater management plans, as well as annual recurring monitoring/enforcement costs. The cost estimates provided by the data source are on a per person basis which were used to derive per city and total costs for large size cities (populations greater than 250 thousand) and medium size cities (populations between 100 and 250 thousand). Following the effective dates for the rule, we assumed that capital costs for large cities would be incurred in equal increments in years 1990 and 1991, with annual costs phased-in with each increment of capital. We assumed that medium size cities would incur capital costs in 1992, with annual costs also beginning in that year.

Effluent Limitation Guidelines: Organic Chemicals and Plastics and Synthetic Fibers Industry

(a) Status: Final Rule (52 FR 42522; November 5, 1987).

(b) Regulatory option: See 52 FR 42522.

(c) Data source: *Economic Impact Analysis of Effluent Limitation and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Industry*, Prepared for the US EPA Office of Water Regulations and Standards by Abt Associates, Inc., September 1987.

(d) Derivation and timing of estimates: The data source (pp. 1-3) provides capital and O&M costs. We assumed the capital costs would be incurred in equal increments in years 1988, 1989, and 1990. O&M costs were assumed to phase-in with each increment of capital expenditure.

Effluent Limitation Guidelines: Offshore Oil and Gas Industry

(a) Status: Proposed Rule (50 FR 34592; August 26, 1985). Expected Finalization Date: July 1991.

(b) Regulatory option: This rule would establish BAT, BCT, and NSPS standards for drilling fluids and drill cutting waste streams from offshore oil and gas extraction facilities. The costs reflect Regulatory Approach A.

(c) Data source: *Economic Impact Analysis of Effluent Limitation Guidelines and Standards for the Notice of Data Availability for Drilling Fluids and Drill Cuttings for the Offshore Oil and Gas Industry*, Prepared for the US EPA Office of Water Regulations and Standards by Eastern Research Group, Inc., October 1988.

(d) Derivation and timing of estimates: The data source (p. 7) reports total annual costs for regulatory approach A. (No capital costs were reported for the rule.) We asumed that the rule would be promulgated in 1991 and that annual O&M costs would begin in that year.

4.2. Drinking Water

Volatile Organics

(a) Status: Final rule (52 FR 25690; July 8, 1987).

(b) Regulatory option: See 52 FR 25690.

(c) Data sources: See Appendix F.

(d) Derivation and timing of estimates: See Appendix F.

Fluorides

(a) Status: Final rule (52 FR 11396; April 2, 1986).

(b) Regulatory option: See 52 FR 11396.

(c) Data sources: See Appendix F.

(d) Derivation and timing of estimates: See Appendix F.

Total Coliforms

(a) Status: Final rule (54 FR 27544; June 29, 1989).

(b) Regulatory option: See 54 FR 27544.

(c) Data sources: See Appendix F.

(d) Derivation and timing of estimates: See Appendix F.

Surface Water Treatment

(a) Status: Final Rule (54 FR 27486; June 29, 1989).

(b) Regulatory option: See 54 FR 27486.

(c) Data sources: See Appendix F.

(d) Derivation and timing of estimates: See Appendix F.

Phase II Inorganics and Synthetic Organics

(a) Status: Proposed rule (54 FR 22062; May 22. 1989). Expected finalization date: December 1990.

(b) Regulatory option: This proposes National Primary Drinking Water Regulations for 30 synthetic organic chemicals (SOCs) and eight inorganic chemicals (IOCs). The regulations set maximum contaminant levels (MCLs) or treatment techniques for the SOCs and IOCs, as well as maximum contaminant level goals (MCLGs).

(c) Data sources: See Appendix F.

(d) Derivation and timing of estimates: See Appendix F.

Lead, Copper, and Corrosion Control

(a) Status: Proposed rule (53 FR 31516; August 16, 1988). Expected finalization date: December 1990.

(b) Regulatory option: The proposed regulation sets new MCLs and MCLGs for naturally occurring lead and copper in drinking water. The proposed rule also would require drinking water systems to install certain corrosion control treatments in all systems that exceed no-action levels for pH, alkalinity, or average lead content.

(c) Data sources: See Appendix F.

(d) Derivation and timing of estimates: See Appendix F.

Mandatory Disinfection

(a) Status: Expected proposal date: September 1990. Expected finalization date: September 1991.

(b) Regulatory option: This rule would establish MCLs and monitoring and public reporting requirements for disinfectants in drinking water.

(c) Data sources: See Appendix F.

(d) Derivation and timing of estimates: See Appendix F.

Radionuclides

(a) Status: Expected proposal date: February 1991. Expected finalization date: August 1992.

(b) Regulatory option: This rule would establish MCLs and monitoring and public reporting requirements for certain radionuclides, including radium, uranium, total alpha, and beta particle and photon emitters.

(c) Data sources: See Appendix F.

(d) Derivation and timing of estimates: See Appendix F.

Phase IV Inorganics and Synthetic Organics

(a) Status: Under development. Expected proposal date: 1991.

(b) Regulatory option: This rule will set drinking water MCLs and MCLGs for a set of IOCs and SOCs not covered in the Phase II contaminants rulemaking.

(c) Data sources: See Appendix F.

(d) Derivation and timing of estimates: See Appendix F.

5. LAND REGULATIONS

5.1. Solid Waste

Municipal Landfill Subtitle D Criteria (Revision)

(a) Status: Proposed rule (53 FR 33314; August 30, 1988). Expected finalization date: Spring 1990.

(b) Regulatory option: This rule would establish revisions to RCRA Subtitle D criteria for municipal solid waste landfills. The proposal establishes general facility standards, groundwater monitoring requirements, post-closure standards, and performance and operating requirements.

(c) Data source: *Draft Regulatory Impact Analysis of Proposed Revisions to Subtitle D Criteria for Municipal Solid Waste Landfills*, Prepared for the US EPA Office of Solid Waste by Temple, Barker & Sloan, Inc., August 15, 1988.

(d) Derivation and timing of estimates: The data source (p. V-15) reports total annualized costs of the rule as $691-$880 million (calculated at a 3 percent amortization rate over

20 years). We took the midpoint of this range, and assumed that 75 percent of it (or $590 million) represents annual capital costs based on the high percentage of landfills that require liners, covers, leachate collection systems, and recovery wells. The remaining $196 thus represents annual O&M costs. The annual capital estimate was then divided by the annualization factor to figure total capital costs of $8777 million. We assumed the rule would become effective in 1991, and attributed a tenth of total capital costs to each of the years 1991-2000. Annual O&M costs were assumed to begin in 1991 and remain at this level through year 2000.

Municipal Waste Combustors Air Standards

(a) Status: Advanced notice of proposal (52 FR 25399; July 7, 1987). Expected proposal date: December 1990.

(b) Regulatory option: This rule would regulate municipal waste combustor air emissions under CAA Sections 111(b) and (d).

(c) Data sources:

(1) Sector Study municipal cost data base developed by Brett Snyder (Office of Policy Analysis) from data supplied by Mike Johnston.

(2) *Municipal Waste Combustors Study: Report to Congress*, US EPA, EPA/530-500-87-021a, June 1987.

(d) Derivation and timing of estimates: Unit capital and O&M costs for three different types of existing and plannned facilities were calculated by Data Source 1 using data derived from Data Source 2 and discussion with Mike Johnston. Data Source 1 calculated total costs for different city size categories by multiplying these unit cost estimates by data on the number of each different type of planned and existing facitilies provided by Data Source 2 (Appendix B tables). We aggregated costs for each city size category to derive national costs for both planned and existing facilities. We assumed that the regulation will not be promulgated until 1991 and by that time all planned facilities will have come on-line. We assumed that capital costs would be incurred in equal increments in years 1991 and 1992, and O&M costs associated with each capital increment would begin in the following years.

Municipal Waste Combustors Ash Management

(a) Status: Expected proposal date: September 1990. Expected finalization date: November 1991.

(b) Regulatory option: Land disposal management standards for controlling releases from municipal combustion ash corresponding to the most stringent landfill diposal option.

(c) Data sources:

(1) Sector Study municipal cost data base developed by Brett Snyder (Office of Policy Analysis) with assistance from Sharon Stahl (Pollution Prevention Office).

(2) *Draft Regulatory Impact Analysis of Proposed Revisions to Subtitle D Criteria for Municipal Solid Waste Landfills*, US EPA Office of Solid Waste, December 11, 1987.

(d) Derivation and timing of estimates: The RIA provides estimates of the tonnage of waste produced by municipal incinerators. Data Source 1 derived costs by multiplying this estimate of waste produced by an efficiency factor of 20 percent to represent the portion of incinerated waste that ends up as ash. This estimate of ash produced was then multiplied by capital and O&M cost/ton estimates from the RIA associated with the most stringent landfill disposal option. We assumed that capital costs would be incurred in equal increments in years 1991 and 1992, and O&M costs would begin in year 1993.

Management of Used Oil

(a) Status: Proposed rule (50 FR 49212; November 29, 1985). Expected finalization date: 1990.

(b) Regulatory option: The option imposes modified hazardous waste regulations on all facilities in the used oil mangement system, including generators, intermediate facilities, and end users of used oil. Facilities generating less than 1,000 kilograms of used oil per month would be exempt from this regulatory option.

(c) Data source: *Regulatory Impact Analysis of Proposed Standards for the Management of Used Oil*, Temple, Barker & Sloan, Inc., November 1985.

(d) Derivation and timing of estimates: The data source (pp. 1-5) reports an annualized cost for the regulatory option of $167 million per year in 1984 dollars. The data source (Table V-18 on p. V-21) also indicates that approximately 43 percent of annualized costs are annual O&M costs, and 57 percent are annual capital costs. The next step was to back out the effect of annualization on the capital costs, producing a present value estimate for capital costs of $2008 million. We assumed that the rule would become effective in 1992, and one-fourth of total capital costs would be incurred over each of the first four years (1992- 1995). Annual O&M costs were assumed to begin in 1992 and remain constant for a 20 year period.

5.2. Hazardous Waste

Land Disposal Restrictions—California List Wastes

(a) Status: Final rule (52 FR 25760; July 8, 1987).

(b) Regulatory option: See 52 FR 25760.

(c) Data source: *Regulatory Impact Analysis of Restrictions on the Land Disposal of California List Wastes*, Prepared for the US EPA Office of Solid Waste by ICF, Inc., July 1987.

(d) Derivation and timing of estimates: The data source reports total annualized costs (calculated using a 5.5 percent amortization rate over a 20 year period) of the rule as $94 million in 1986 dollars, but did not include enough information to dissaggregate costs into fixed and variable cost components. Therefore, it was assumed that the division of annualized costs between capital and O&M cost components would be similar to that of the California list wastes underground injection control rule (The underground injection rules are discussed later in this appendix.) The ratio of annual O&M costs to total annualized costs for the California list underground injection rule is 90.5 percent. Multiplying this ratio by the $94 million annualized cost produces an annual O&M cost estimate of $85 million and an annual capital cost estimate of $9 million. We then divided the annual capital cost estimate by the annualization factor to figure a total capital cost of $108 million. One-half of the capital cost estimate was placed in the year the rule went into effect (1987), and the other half two years later. Annual O&M costs were assumed to begin in year 1987.

Land Disposal Restrictions—Solvent and Dioxin Wastes

(a) Status: Final rule (51 FR 4057; November 7, 1986).

(b) Regulatory option: See 51 FR 4057.

(c) Data sources:

(1) *Regulatory Analysis of Restrictions on Land Disposal of Certain Solvent Waste*, Prepared for the US EPA Office of Solid Waste by Industrial Economics, Inc., November 1987.

(2) *Regulatory Analysis of Restrictions on Land Disposal of Certain Dioxin-Containing Wastes*, Prepared for the US EPA Office of Solid Waste by Industrial Economics, Inc., November 1987.

(d) Derivation and timing of estimates: The estimation procedure corresponds to the methodolgy discussed above for California list wastes.

Land disposal Restrictions—First Third Wastes

(a) Status: Final rule (53 FR 17578; August 17, 1988).

(b) Regulatory option: See 53 FR 17578.

(c) Data source: *Regulatory Impact Analysis of the Land Disposal Restrictions on First Third Wastes*, Prepared for the US EPA Office of Solid Waste, by ICF, Inc., August 1988.

(d) Derivation and timing of estimates: The estimation procedure corresponds to the methodology discussed above for the California List waste rule.

Land Disposal Restrictions—Second Third Wastes

(a) Status: Final rule (54 FR 26594; June 23, 1989).

(b) Regulatory option: See 54 FR 26594.

(c) Data source: *Results of the Preliminary Analysis of the Proposed Second Third LDR Rule*, Memorandum from Ralph Braccio, Dan Pyne, Jean Tilly (ICF) and Barbara Hendricks (DPRA) to Bill Vocke (EPA), December 18, 1988.

(d) Derivation and timing of estimates: The derivation procedure corresponds to the methodology discussed above for the California list waste rule.

Land Disposal Restrictions—Third Third Wastes

(a) Status: Proposed rule (54 FR 48372; November 22, 1989). Expected finalization date: May 1990.

(b) Regulatory option: The rule will establish land disposal restrictions and treatment standards for the Third Third of scheduled wastes.

(c) Data source: *Regulatory Impact Analysis for Third Third Scheduled Wastes Proposed Rule*, Prepared for the US EPA Office of Solid Waste by ICF Inc., November 5, 1990.

(d) Derivation and timing of estimates: The derivation procedure corresponds to the methodology discused above for the California list waste rule.

Underground Injection Control: Land Disposal Restrictions (LDR) for Solvents and Dioxins, California List, First Third, Second Third, and Third Thirds Wastes

(a) Status: Solvents and Dioxins—Final rule (53 FR 28118; July 26, 1988). Cal. List and First Thirds—Final rule (53 FR 30908; August 16, 1988). Second Thirds—Final Rule (54 FR 26594: June 23, 1989). Third Thirds—Proposed Rule (54 FR 48372; November 22, 1989).

(b) Regulatory option: See 53 FR 28118, 53 FR 30908, 54 FR 26594 and 54 FR 48372.

(c) Data sources:

(1) *Regulatory Impact Analysis of Underground Injection Control Program: Proposed Hazardous Waste Disposal Injection Restricitions*, Prepared for the US EPA Office of Drinking Water by Temple, Barker & Sloan, Inc., July 24, 1987.

(2) *Regulatory Impact Analysis of Proposed Hazardous Waste Disposal Restrictions for Class I Injection of California List and First Third Wastes*, Prepared for the US EPA Office of Drinking Water by the Cadmus Group, Inc., December 4, 1987.

(3) *Draft Regulatory Impact Analysis of The Proposed Hazardous Waste Disposal Restrictions For Class I Injection of Third Third Wastes*, Prepared for the US EPA Office of Drinking Water by the Cadmus Group, Inc., August 18, 1989.

(4) *Second and Third Third Cost Estimates*, Memorandum to Bruce Kobelski (EPA) from Beverly Brown Cadorette (Cadmus), December 12, 1988.

(d) Derivation and timing of estimates: The methodology and data discussed below were used to derive costs for California List wastes underground injection restrictions. It corresponds to the methodology used to calculate costs for each of the other underground injection provisions, which are not discussed.

Data Source 2 reports annual O&M costs as $5 million and capital and petition cost of $3 million for California list wastes. Capital costs were combined with petition costs to calculate total fixed costs. We assumed that half of the wastes affected would be granted a two year variance, and capital costs associated with these provisions would thus not be incurred until two years after the rule goes into effect. Total capital costs were then divided equally and one half was assumed to be incurred in the year the provision went final (1988) and the other half incurred two years later (1990).

Unlike the other underground injection provisions, the RIA for the Second Third wastes did not break costs into capital and O&M cost components, but rather only reported an annualized cost. Thus, the following methodolgy was used to derive capital and O&M costs for this rule. First, the average ratio between annual O&M costs and total annualized costs for the four other UIC rules was calculated. Annual O&M costs were found to be roughly 80 percent of the total annualized costs for these provisions. We then calculated O&M costs by taking 80 percent of the total annualized cost for the Second Third wastes as reported by Data Source 4. We then subtracted the resulting O&M cost estimate from the reported annualized cost to figure annual capital cost. The effect of amortization was eliminated to calculate total capital costs. As with the other underground injection provisions, capital cost was divided by two, and one-half placed in the year the rule was finalized and one-half two years later.

Toxicity Characteristics Rule

(a) Status: Proposed Rule: (51 FR 21648; June 13, 1986). Supplemental proposal: (53 FR 18024; May 19, 1988). Expected finalization date: 1990.

(b) Regulatory option: This rule would amend the hazardous waste identification regulations by introducing a new extraction procedure based on chronic toxicity reference levels combined with a compound-specific dilution/attenuation factor to calculate the regulatory level concentrations for individual toxicants.

(c) Data source: *Toxicity Characteristic Regulatory Impact Analysis, Final Report*, prepared for the US EPA by ICF Inc., March 1990.

(d) Derivation and timing of estimates: The data source reports annualized costs (calculated at 3 percent over 20 years) for compliance as $250 million, and annualized cost for surface impoundment closure as $150 million in 1988 dollars (or $236 and $141 million, respectively, in 1986 dollars). Using the professional judgement of Mark Ralston (EPA) and Chris Lough (DPRA), we assumed that 75 percent of the annual compliance cost estimate ($177 million) represents annual O&M costs, and the remainder ($59 million) represents annual capital costs. Based on the OPPE definition of capital, closure costs were assumed to be annual O&M costs. Also, compliance capital costs were assumed to occur over a 20 year period and closure costs over the first five years after the rule goes into effect (assumed to be 1991). We then calculated the present value of compliance capital costs as $875 million. One-twentieth of this total capital cost estimate was used to represent compliance capital costs in each of the years 1991-2000. Annual compliance O&M costs of $177 million were assumed to begin in 1991 and remain at this level through year 2000. The present value of closure costs were computed as $2098 million. One-fifth of this estimate was attributed to O&M costs and placed in each of the years 1991-1995.

Location Standards Rule

(a) Status: Expected proposal date: Spring 1990.

(b) Regulatory option: Will set standards for the proper citing of hazardous waste treatment, storage and disposal facilties, as well requirements for storage, transport, and removal of wastes, and facility closure.

(c) Data source: *Summary Regulatory Impact Analysis/Background Information Document for the Development of Subtitle C Location Standards Under Section 3004(o)(7) of RCRA*, Prepared for the US EPA by ICF, Inc., January 26, 1990.

(d) Derivation and timing of estimates: We characterized location standards cost components into capital and O&M costs as follows: Capital costs components were assumed to include site characterization; engineering demonstration; storage, transport and removal of wastes; closure of container storage units, and faciltiy closure. O&M costs include offsite disposal of wastes and extended post-closure care. For closure costs, we determined the lower- and upper-bound proportion of capital and O&M costs (based on the breakdown of closure cost components). We then determined the timing of when facilities will get their operating permits reviewed (location standards are imposed at the time of permit renewal) using a study of the review cycle for facilities on the permit track and on the closure track. Land based facilities are on a 5 year permit review cycle and non-land based facilities are on 10 year permit review cycle. We assumed that location standards would not go into effect until 1994, and that 80 percent of the costs are attributable to land based units and 20 percent to non-land based units (based on the breakdown of the costs of closure with waste removal). Based on the these assumptions, the timing of the imposition of location standards were determined. Using data on unit costs from the data source, we then multiplied the capital costs by the percentage of facilties assumed to comply with the location standards in each year using the estimated schedule. We assumed that facilities performing closure with waste removal took an average of 6 years to redispose wastes, and that for closure with wastes in place, facilities performed 15 years of off-site disposal in the lower bound and 5 years in the upper-bound. Using these assumptions, we spread O&M costs for closure with waste removal over six years, and O&M costs of closure with waste in place over 15 years in the lower-bound, and 5 years in the upper-bound. We assumed that no extended post-closure care costs would be incurred prior to the year 2000 because all facilties affected by the location standards are assumed to undertake 30 years of post-closure care prior to starting extended post-closure care. Thus, these costs will be incurred well after the year 2000. We then took the mid-point of the cost ranges computed for capital and O&M costs under the lower- and upper-bound assumptions.

Corrective Action for Solid Waste Management Units (SWMU)

(a) Status: Expected proposal date: 1990.

(b) Regulatory option: The rule would set technical standards and procedures for conducting corrective action for injury to groundwater, soil, air and surface waters caused by significant releases from SWMUs at operating, closed, or closing RCRA facilities. For the cost estimates presented in this report, a mid-pint between the costs for regulatory option B and C were used. Under regulatory option B, corrective action would be triggered if pollutant concentrations were detected above health-based standards. This option requires the use of four remedies (excavation, excavation with recovery wells, capping, and recovery wells), one of which is simulated for every facilty that triggeres corrective action, regardless of the practicality or feasibility of the remedy. Regulatory option C differs from option B in that owners and operators would have considerable flexibility in choosing corrective action remedies.

(c) Data source: *Draft Regulatory Impact Analysis for the Proposed Rulemaking on Corrective Action for Solid Waste Management Units*, Prepared for the US EPA Office of Solid Waste by ICF, Inc., September 1988.

(d) Derivation and timing of estimates: Agency progress to date with corrective action indicates the initiation of an estimated 10 facilities in each of the years 1988-1990, an estimated 25 facilities in 1991, and 50 facilities in 1992. We assumed that the number of facilities initiating corrective action would increase by five percent per year from the year 1992 level. This produced a schedule of facility initiation for the years 1988- 2000 encompassing a total of 685 facilities. The data source (p. 7-7) gives the distribution of remedies selected under both regulatory options B and C. We averaged remedy selections for both options to produce the distribution chosen in a hypothical mid-case scenario. This procedure indicated that 6.1 percent of facilities would utilize excavation, 51.3 percent would use capping, 24.7 percent would use recovery wells, 15.2 percent would use excavation and recovery wells, and 2.9 percent would do nothing because clean-up is not feasible. Based on information from the data source on typical costs for each remedy allocated among capital costs, first year O&M costs, and ongoing O&M costs, we calculated mean costs for each cost component by remedy for the hypotheical mid-case scenario. Based on the distribution of remedies for the mid-case scenario, we created weighted average costs for each corrective action initiated. This produced per-facility capital costs of $1.2 million (primarily caps and well installation), year one O&M costs of $23.4 million (exclusively excavation), and recurring O&M costs of $59 thousand (for ongoing operation of recovery wells). We then added $400 thousand as year one O&M costs to reflect investigative expenses. We then applied per-facility costs to the estimated schedule of facility corrective action initiations to produce capital and O&M cost estimates for each year over the period 1988-2000.

Minimum Technology Rule

(a) Status: Final codification rule (50 FR 28702; July 15, 1985).

(b) Regulatory option: See 50 FR 28702.

(c) Data source: *Hazardous Waste Management System; Final Codification Rule*, 50 FR 28702, July 15, 1985.

(d) Derivation and timing of estimates: For landfills, the preamble to the RIA section gave the following costs in 1984 dollars: annualized costs of $10.2 million (calculated at 3 percent over 20 years) and initial costs of $9.7 million. Costs were converted into 1986 dollars. We then calculated present value costs by backing out the annualization procedure, and then subtracted initial costs from the resulting estimate to isolate present value O&M costs. This estimate was then reannualized to figure annual O&M costs of $10 million per year for landfills. Capital costs were assumed to occur before 1986. For surface impoundments, the preamble to the RIA section says that total annualized costs are $53.2 million in 1984 dollars (calculated at 3 percent over 20 years). This was converted into a present value estimate in 1986 dollars ($845.7 million). The preamble also indicates that 46-79 percent of the inital cost is for early closure of of unlined surface impoundments, and the remaining for construction of new surface impoundments. Based on this and information indicating that few new surface impoundments are being built, we attributed 75 percent of the present value cost estimate to early closure and assumed these are O&M costs, and attributed 25 percent to new construction which were assumed to be capital costs. We then annualized closure costs to calculate annual O&M costs of $43 million for surface impoundments. This was added to the estimate of annual O&M costs for landfills and placed in each of the years 1986-2000. We assumed that one-fifth total capital costs for surface impoundments would be incurred in each of the years 1986-1990.

Small Quantity Generators Rule

(a) Status: Final rule (51 FR 10146; March 24, 1986).

(b) Regulatory option: See 51 FR 10146.

(c) Data source:

(1) *Hazardous Waste Management System: Final Codification Rule*, 50 FR 28702, July 15, 1985.

(2) *Report to Congress on Small Qunatity Generators of Hazardous Waste: Volume III*, US EPA, September 1986.

(d) Derivation and timing of estimates: Data Source 2 (Exhibits 6-1,6-2, and 6-3) reports initial and annualized costs for each of three parts of the rule: Part 262, Part 265, and Subpart I. We annualized the initial costs for each part (at 3 percent over 20 years) and then subtracted the resulting estimates from their corresponding total annualized cost estimates to compute annual O&M costs for each part of the rule. These were summed to figure total annual O&M costs, which were placed in each of the years 1986-2000. Initial costs were assumed to occur before 1986 and were thus not included.

Hazardous Waste Tanks

(a) Status: Final rule (51 FR 25422; July 14, 1986).

(b) Regulatory option: See 51 FR 25422.

(c) Data sources:

(1) *Cost Analysis of RCRA Regulations for Hazardous Waste Tank Facilities*, Prepared for the US EPA by ICF, Inc., June 1986.

(2) *Cost and Economic Impact Analysis of Proposed RCRA Hazardous Waste Accumulation Tank Regulations for 100-1,000 kg/mo. Generators*, Prepared for the US EPA by ICF, Inc., August 1986.

(d) Derivation and timing of estimates: Data Source 1 reports total annualized costs as $30 million (calculated using a 3 percent interest rate over 20 years). Using information from the 1986 RIA for the Small Quantity Generators rule, we estimated that 27 percent of total annualized cost, or $8 million, is annual capital cost, and the remaining $22 million is annual O&M cost. We assumed the one-fifth of total capital costs would be incurred in each of the years 1986-1990, and that constant annual O&M costs would be incurred in years 1986-2000.

5.3. Underground Storage Tanks

Underground Storage Tanks Containing Petroleum—Financial Responsibility Requirements

(a) Status: Final Rule (53 FR 43322; October 26, 1988).

(b) Regulatory option: See: 53 FR 43222.

(c) Data source: *Regulatory Impact Analysis for Financial Responsibility Requirements for Petroleum Underground Storage Tanks*, US EPA Office of Underground Storage Tanks, October 1988.

(d) Derivation and timing of estimates: See Appendix H.

Underground Storage Tanks Containing Petroleum or Hazardous Substances—Technical Requirements

(a) Status: Final rule (53 FR 37082; September 23, 1988).

(b) Regulatory option: See: 53 FR 37082.

(c) Data source: See Appendix H.

(d) Derivation and timing of estimates: See Appendix H.

5.4. Superfund

Superfund Site Clean-ups

(a) Status: This is an ongoing program. Revisions to the National Contingency Plan (NCP), which directs clean-up activities, were proposed on December 21, 1988 (53 FR 51394). Expected finalization date: 1990.

(b) Regulatory option: The cost estimates for future years reflect the new emphasis on treatment versus containment remedies set out in the proposed revisons to the NCP. The cost estimates for past years reflect the actual mix of treatment versus containment remedies used in those years.

(c) Data sources: See Appendix H.

(d) Derivation and timing of estimates: See Appendix H.

Land pollution rules not included in the data set.

Various new and forthcoming rules pursuant to Subtitle C of RCRA were excluded from the cost data set because adequate cost data could not be obtained. These include rules for which cost analyses may have been performed, but detailed documentation of these analyses were not available. For the most part, however, these rules impose minor costs to the private sector. Such rules include, for example, the hazardous waste burning rule and amendments to emission standards for hazardous waste incinerators.

Other forthcoming Subtitle C rules for which cost data were not obtained include the UST containing hazardous substances financial responsibility rule and the corrective action rule for regulated hazardous waste management units, among others.

6. CHEMICAL REGULATIONS

6.1. Toxic Substances

Asbestos in Schools Rule

(a) Status: Final rule (52 FR 41826; October 30, 1987).

(b) Regulatory option: See 52 FR 41826.

(c) Data source: Sector Study municipal cost data base developed by Brett Snyder (Office of Policy Analysis) with assistance from Brian Muehling (Office of Toxic Substances, Economics and Technology Division).

(d) Derivation and timing of estimates: Cost tables prepared by Brian Muehling using Tables 14a,b, and c from the RIA were used by Data Source 1 to derive costs for different city size categories. These costs include per school capital costs for develoment of a management plan and asbestos removal and containment, and per school annual costs for inspection and sampling, operation and maintenance, and re-inspection. We aggregated the costs for different city size categories to calculate national capital and annual costs for the rule. We assumed the sampling and inspection costs would be incurred in years 1988 and 1989, and all capital costs would be incurred in equal increments over the years 1989-1992. O&M costs are assumed to phase-in with each increment of capital.

Asbestos in Products Ban/Phasedown

(a) Status: Final rule (54 FR 29460; July 12, 1989).

(b) Regulatory option: See 54 FR 29460.

(c) Data source: *Regulatory Impact Analysis of Controls on Asbestos and Asbestos Products: Volume I Technical Report*, Prepared for the US EPA Office of Toxic Substances by ICF, Inc., October 11, 1988.

(d) Derivation and timing of estimates: The data source (p. IV- 13) reports present value (3 percent over fifteen years) *social costs* derived using welfare analysis for Alternative J, low decline baseline scenario. (This regulatory option most closely resembles the final rule's requirements.) We derived annual industry costs for each year over the fifteen year period by eliminating the discounting factor and distributing the resulting cost estimates relating to specific product categories according to the various effective dates for their phasedown or ban.

7. MULTI-MEDIA REGULATIONS

Emergency Planning and Community Right to Know Program (EPCRA)

1. Emergency & Hazardous Chemical Inventory Forms and Community Right-to-Know Reporting Requirements; 2. Extremely Hazardous Substance List and Threshold Reporting Requirements; Emergency Planning and Release Quantification Requirements; 3. Toxic Chemical Release Reporting; and 4. Trade Secret Claims.

(a) Status: Final rules (52 FR 38344, October 15, 1987; 52 FR 13378, April 22, 1987; 53 FR 4500, February 16, 1988; and 53 FR 28772, July 29, 1988).

(b) Regulatory option: See above FR cites.

(c) Data source: *The Unified Title III Economic Analysis: Subject Paper on Facilities - Vol.1*, Prepared for the US EPA Office of Toxic Substances by ICF, Inc., January 8, 1988.

(d) Derivation and timing of estimates: The costs for all EPCRA regulations were derived from Tables G-1 to G-8 in Appendix G of Data Source 1. The capital costs represent one-time costs associated with regulation familiarity and recordkeeping setup; the annual costs are for annual reporting requirements. Following information from Data Source 1 (pp. 2-10 - 2-13), capital costs for the various EPCRA requirements were placed in years 1988, 1989, and 1990, and annual costs in years 1988 through year 2000.

Table A-1: AIR POLLUTION CONTROL CAPITAL COSTS FOR NEW REGULATIONS*

(millions of 1986 dollars)

Rpt Sec	Program/Regulation	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	PM NAAQS		477	477	477											
	Lead NAAQS					106	106	106								
	Acid Rain (a)															
	Toxic Substances (a)															
	Stratospheric Ozone (b)															
	Total New Regs		477	477	477	106	106	106								
	Full Implementation															
	Ozone NAAQS: Attain (a)															
	TSDF															
	Muni. Landfills															
	Solvent Use															
	Marine Vessels															
	New CTG															
	Progress Req.															
	Full Implementation															
	Total Stationary		477	477	477	106	106	106								
3.1.2	Mobile Sources															
	New Regulations															
	Fuel Volatility															
	NOx and Particulates			96	97	97	147	151	156	186	191	197	203	210	216	223
	Diesel Fuel															
	Toxic Substances (a)															
	Total New Regs			96	97	97	147	151	156	186	191	197	203	210	216	223
	Full Implementation															
	Ozone NAAQS: Attain.															
	Fuel Volatility II															
	Evap./running losses															
	Tailpipe/useful life															
	Stage II															
	Basic I/M															
	Enhanced I/M															
	LDV NOx															
	Alt. Fuels															
	Full Implementation															
	Total Mobile			96	97	97	147	151	156	186	191	197	203	210	216	223
3.1.4	Total Air Pollution		477	573	574	203	253	257	156	186	191	197	203	210	216	223
3.2	Radiation															
	Radon Advisory	1	4	34	79	79	94	89	93	98	103	107	112	117	122	127
	Total Radiation	1	4	34	79	79	94	89	93	98	103	107	112	117	122	127
3.3	Total Air & Radiation	1	481	607	653	282	347	346	249	284	294	304	315	327	338	350

Footnotes to Table A-1

* Documentation for these estimates is provided in the regulation summaries in previous sections of this appendix.

(a) Only annualized cost data that include amortized capital costs are available. These costs are reported in Table A-1A.

(b) Only social cost data derived from welfare analysis are available. These costs are reported in Table A-1A.

Table A-1A: AIR POLLUTION CONTROL OPERATING COSTS FOR NEW REGULATIONS

(millions of 1986 dollars)

Rpt Sec	Program/Regulation	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3.1	Air Pollution															
3.1.1	Stationary Sources															
	PM NAAQS			17	35	52	52	52	52	52	52	52	52	52	52	52
	Lead NAAQS						10	20	29	29	29	29	29	29	29	29
	Acid Rain (a)										327	654	656	654	654	1,308
	Toxic Substances (a)								124	247	557	743	929	1,239	1,548	1,858
	Stratospheric Ozone (b)							5	5	63	66	70	74	79	448	641
	Total New Regs			17	35	52	62	77	210	391	1,031	1,548	1,738	2,053	2,731	3,888
	Full Implementation															
	Ozone NAAQS: Attain. (a)															
	TSDF								1,624	1,624	1,643	1,662	1,681	1,701	1,720	1,739
	Muni. Landfills								62	62	63	63	64	64	65	65
	Solvent Use								378	382	386	390	394	398	402	406
	Marine Vessels								39	40	41	42	43	43	44	45
	New CTG								374	380	386	392	398	403	409	415
	Progress Req.								565	565	565	941	1,317	1,692	2,068	2,444
	Full Implementation								3,042	3,053	3,084	3,490	3,897	4,301	4,708	5,114
	Total Stationary			17	35	52	62	77	3,252	3,444	4,115	5,038	5,635	6,354	7,439	9,002
3.1.2	Mobile Sources															
	New Regulations															
	Fuel Volatility				134	134	134									
	NOx and Particulates						241	259	265	272	279	287	295	305	314	325
	Diesel Fuel							225	173	117	56	31	6	(22)	(49)	(76)
	Toxic Substances (a)										700	1,400	2,100	2,800	2,800	2,800
	Total New Regs				134	134	375	484	438	389	1,035	1,718	2,401	3,083	3,065	3,049
	Full Implementation															
	Ozone NAAQS: Attain.															
	Fuel Volatility II								222	228	232	236	240	243	247	251
	Evap./running losses								57	58	58	59	59	60	60	61
	Tailpipe/useful life								436	440	444	448	452	456	460	464
	Stage II								108	112	116	120	124	127	131	135
	Basic I/M								65	66	67	68	69	70	71	72
	Enhanced I/M								69	70	71	72	73	75	76	77
	LDV NOx								369	371	372	374	375	377	378	380
	Alt. Fuels										145	145	145	145	145	
	Full Implementation								1,326	1,345	1,505	1,522	1,537	1,553	1,568	1,440
	Total Mobile				134	134	375	484	1,764	1,734	2,540	3,240	3,938	4,636	4,633	4,489
3.1.4	Total Air Pollution			17	169	186	437	561	5,016	5,178	6,655	8,278	9,573	10,990	12,072	13,491
3.2	Radiation															
	Radon Advisory			3	8	14	20	25	31	36	42	48	53	59	65	71
	Total Radiation			3	8	14	20	25	31	36	42	48	53	59	65	71
3.3	Total Air & Radiation			20	177	200	457	586	5,047	5,214	6,697	8,326	9,626	11,049	12,137	13,562

Footnotes to Table A-1A

* Documentation for these estimates is provided in the regulation summaries in previous sections of this appendix.

(a) Represent annualized cost data that include amortized capital costs and annual operating and maintenance costs.

(b) Represent social cost data derived from welfare analysis.

Table A-2: WATER POLLUTION CONTROL CAPITAL COSTS FOR NEW REGULATIONS*

(millions of 1986 dollars)

Rpt Sec	Program/Regulation	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
4.1	Water Quality															
	By Regulation															
	Municipal Pretreatment															
	Municipal Sewage Sludge							95								
	Municipal Stormwater					19	19	21								
	ELG: Chem. & Plastics			314	314	314										
	ELG: Offshore Oil & Gas															
	Total by Regulation			314	314	333	19	116								
	By Sector															
	Local Government					19	19	116								
	Private			314	314	314										
	Total By Sector			314	314	333	19	116								
	Full Implementation (Municipal Wastewater)					6,561	6,561	6,561	6,561	6,561	6,561	6,561	6,561	6,561	6,561	6,561
4.2	Drinking Water (a)															
	VOCS															
	Fluoride															
	Surface Water Treatment															
	Coliform															
	Phase II: IOCS & SOCS															
	Lead, Copper & Corrosion															
	Radionuclides															
	Disinfection															
	Phase IV: IOCS & SOCS															
	Total Drinking Water			36	73	80	379	865	1,175	1,381	1,690	1,787	1,358	639	225	225
	Drinking Water															
	By Sector															
	Local Government			29	59	65	310	707	960	1,128	1,380	1,460	1,109	522	184	184
	Private			7	13	15	69	158	215	253	309	327	249	117	41	41
	Total By Sector			36	73	80	379	865	1,175	1,381	1,690	1,787	1,358	639	225	225

Footnotes to Table A-2

* Documentation for these estimates is provided in the regulation summaries in previous sections of this appendix.

(a) Cost estimates for individual drinking water regulations are not available because the same control of techniques are often utilized to meet different drinking water chemical standards (*i.e.*, co-control for several chemicals inhibits accurate isolation of costs for individual rules).

Table A-2A: WATER POLLUTION CONTROL OPERATING COSTS FOR NEW REGULATIONS[*]

(millions of 1986 dollars)

Rpt Sec	Program/Regulation	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
4.1	Water Quality															
	By Regulation															
	Municipal Pretreatment			2	5	7	10	10	10	10	10	10	10	10	10	10
	Municipal Sewage Sludge								33	33	33	33	33	33	33	33
	Municipal Stormwater					10	20	30	30	30	30	30	30	30	30	30
	ELG: Chem. & Plastics				137	274	412	412	412	412	412	412	412	412	412	412
	ELG: Offshore Oil & Gas						77	77	77	77	77	77	77	77	77	77
	Total by Regulation			2	142	291	519	529	562	562	562	562	562	562	562	562
	By Sector															
	Local Government			2	5	17	30	40	73	73	73	73	73	73	73	73
	Private				137	274	489	489	489	489	489	489	489	489	489	489
	Total By Sector			2	142	291	519	529	562	562	562	562	562	562	562	562
	Full Implementation (Municipal Wastewater)															
4.2	Drinking Water (a)															
	VOCS															
	Fluoride															
	Surface Water Treatment															
	Coliform															
	Phase II: IOCS & SOCS															
	Lead, Copper & Corrosion															
	Radionuclides															
	Disinfection															
	Phase IV: IOCS & SOCS															
	Total Drinking Water			89	178	179	319	519	580	691	878	953	990	1,143	1,259	1,259
	Drinking Water															
	By Sector															
	Local Government			73	146	146	260	424	474	565	717	779	808	934	1,029	1,029
	Private			16	33	33	58	95	106	126	161	174	181	209	230	230
	Total By Sector			89	178	179	319	519	580	691	878	953	990	1,143	1,259	1,259

Footnotes to Table A-2A

[*] Documentation for these estimates is provided in the regulation summaries in previous sections of this appendix.

(a) Cost estimates for individual drinking water regulations are not available because the same control of techniques are often utilized to meet different drinking water chemical standards (*i.e.*, co-control for several chemicals inhibits accurate isolation of costs for individual rules).

Table A-3: LAND POLLUTION CONTROL CAPITAL COSTS FOR NEW REGULATIONS*

(millions of 1986 dollars)

Rpt Sec	Program/Regulation	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.1	Solid Waste															
	By Regulation															
	Mun. Landfill						877	877	877	877	877	877	877	877	877	877
	Mun. Comb. Ash & Air Stds						1,228	1,228								
	Used Oil							502	502	502	502					
	Total by Regulation						2,105	2,607	1,379	1,379	1,379	877	877	877	877	877
	By Sector															
	Local Government						2,105	2,105	877	877	877	877	877	877	877	877
	Private							502	502	502	502					
	Total By Sector						2,105	2,607	1,379	1,379	1,379	877	877	877	877	877
5.2	Hazardous Waste															
	Solvents & Dioxins LDR	261		261												
	California List LDR		54		54											
	First Thirds LDR			940	940	940										
	Second Thirds LDR				29	29	29									
	Third Thirds LDR					244	244	244								
	Underground Injection LDR			59	69	88	29	19								
	Toxicity Characteristics						59	59	59	59	59	59	59	59	59	59
	Location Standards									280	84	307	755	55	55	55
	Corrective Action			12	12	12	30	60	66	72	78	84	90	96	102	108
	Min. Technology	52	52	42	42	42										
	Small Qty Generators															
	Hazardous Waste Tanks	24	24	24	24	24										
	Total Hazardous Waste	337	130	1,338	1,170	1,379	391	382	125	411	221	450	904	210	216	222
	By Sector															
	EPA															
	State Government															
	Private	337	130	1,338	1,170	1,379	391	382	125	411	221	450	904	210	216	222
	Total By Sector	337	130	1,338	1,170	1,379	391	382	125	411	221	450	904	210	216	222
5.3	LUST															
	By Regulation															
	Financial Responsibility															
	Municipal						41									
	Private						806									
	Technical Requirements															
	Municipal				473	473	473	473	473	23	23	23	23	602	5	5
	Private				4,777	4,777	4,777	4,777	4,777	433	433	433	433	11,153	95	95
	Total by Regulation				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100
	By Sector															
	Local Government				473	473	514	473	473	23	23	23	23	602	5	5
	Private				4,777	4,777	5,583	4,777	4,777	433	433	433	433	11,153	95	95
	Total By Sector				5,250	5,250	6,097	5,250	5,250	456	456	456	456	11,755	100	100

* Documentation for these estimates is provided in the regulation summaries in previous sections of this appendix.

Table A-3A: LAND POLLUTION CONTROL OPERATING COSTS FOR NEW REGULATIONS*

(millions of 1986 dollars)

Rpt Sec	Program/Regulation	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
5.1	Solid Waste															
	By Regulation															
	Mun. Landfill						196	196	196	196	196	196	196	196	196	196
	Mun. Comb. Ash & Air Stds								122	243	243	243	243	243	243	243
	Used Oil							77	77	77	77	77	77	77	77	77
	Total by Regulation						196	273	395	516	516	516	516	516	516	516
	By Sector															
	Local Government						196	196	318	439	439	439	439	439	439	439
	Private							77	77	77	77	77	77	77	77	77
	Total By Sector						196	273	395	516	516	516	516	516	516	516
5.2	Hazardous Waste															
	Solvents & Dioxins LDR	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113
	California List LDR		95	95	95	95	95	95	95	95	95	95	95	95	95	95
	First Thirds LDR			720	720	720	720	720	720	720	720	720	720	720	720	720
	Second Thirds LDR				23	23	23	23	23	23	23	23	23	23	23	23
	Third Thirds LDR					322	322	322	322	322	322	322	322	322	322	322
	Underground Injection LDR			54	62	107	107	107	107	107	107	107	107	107	107	107
	Toxicity Characteristics						635	635	635	635	635	177	177	177	177	177
	Location Standards									11	14	25	55	57	59	24
	Corrective Action			234	235	236	588	1,175	1,295	1,416	1,537	1,658	1,779	1,901	2,023	2,145
	Min. Technology			53	53	53	53	53	53	53	53	53	53	53	53	53
	Small Qty Generators	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
	Hazardous Waste Tanks	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
	Total Hazardous Waste	167	262	1,323	1,355	1,723	2,710	3,297	3,417	3,549	3,673	3,347	3,498	3,622	3,746	3,833
	By Sector															
	EPA		3	3	3	3	3	3	3	3	3	3	3	3	3	3
	State Government		9	9	9	9	9	9	9	5	5	5	5	5	5	5
	Private	167	250	1,311	1,343	1,711	2,698	3,285	3,405	3,541	3,665	3,339	3,490	3,614	3,738	3,825
	Total By Sector	167	262	1,323	1,355	1,723	2,710	3,297	3,417	3,549	3,673	3,347	3,498	3,622	3,746	3,833
5.3	LUST															
	By Regulation															
	Financial Responsibility															
	Municipal					25	25	34	34	34	7	7	7	7	7	7
	Private					513	513	530	531	531	145	145	146	147	147	147
	Technical Requirements															
	Municipal				80	131	131	131	131	23	23	23	23	23	7	7
	Private				778	1,669	1,669	1,669	1,669	406	406	406	406	406	106	106
	Total by Regulation				858	2,338	2,338	2,364	2,365	994	581	581	582	583	267	267
	By Sector															
	Local Government				80	156	156	165	165	57	30	30	30	30	14	14
	Private				778	2,182	2,182	2,199	2,200	937	551	551	552	553	253	253
	Total By Sector				858	2,338	2,338	2,364	2,365	994	581	581	582	583	267	267

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* Documentation for these estimates is provided in the regulation summaries in previous sections of this appendix.

Table A-4: CHEMICAL POLLUTION CONTROL CAPITAL COSTS FOR NEW REGULATIONS*

(millions of 1986 dollars)

Rpt Sec	Program/Regulation	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
6.1	Toxic Substances															
	By Regulation															
	Asbestos in Schools				830	830	830	830								
	Asbestos in Products (a)															
	Total by Regulation				830	830	830	830								
6.2	By Sector															
	Local Government				830	830	830	830								
	Private															
	Total By Sector				830	830	830	830								

Footnotes to Table A-4

* Documentation for these estimates is provided in the regulation summaries in previous sections of this appendix.

(a) Only social cost data derived from welfare analysis are available. These costs are reported in Table A-4A.

Table A-4A: CHEMICAL POLLUTION CONTROL OPERATING COSTS FOR NEW REGULATIONS*

(millions of 1986 dollars)

Rpt Sec	Program/Regulation	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
6.1	Toxic Substances															
	By Regulation															
	Asbestos in Schools	6		80	80	64	128	191	255	255	255	255	255	255	255	255
	Asbestos in Products (a)				4	4	4	4	50	52	53	94	97	100	103	106
	Total by Regulation	6		80	84	68	132	195	305	307	308	349	352	355	358	361
6.2	By Sector															
	Local Government	6		80	80	64	128	191	255	255	255	255	255	255	255	255
	Private				4	4	4	4	50	52	53	94	97	100	103	106
	Total By Sector	6		80	84	68	132	195	305	307	308	349	352	355	358	361

Footnotes to Table A-4A

* Documentation for these estimates is provided in the regulation summaries in previous sections of this appendix.

(a) Represent social cost estimates derived from welfare analysis.

Table A-5: MULTI-MEDIA CONTROL CAPITAL COSTS FOR NEW REGULATIONS*

(millions of 1986 dollars)

Rpt Sec	Program/Regulation	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7.1	Multi-Media															
7.4	SARA Title III															
	Municipal			149												
	Private			1,716	371	1,519										
7.6	Total Multi-Media			1,865	371	1,519										

Footnotes to Table A-5

* Documentation for these estimates is provided in the regulation summaries in previous sections of this appendix.

Table A-5A: MULTI-MEDIA CONTROL OPERATING COSTS FOR NEW REGULATIONS*

(millions of 1986 dollars)

Rpt Sec	Program/Regulation	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7.1	Multi-Media															
7.4	SARA Title III															
	Municipal				24	24	24	24	24	24	24	24	24	24	24	24
	Private			101	310	216	538	538	538	538	538	538	538	538	538	538
7.6	Total Multi-Media			101	334	240	562	562	562	562	562	562	562	562	562	562

Footnotes to Table A-5A

* Documentation for these estimates is provided in the regulation summaries in previous sections of this appendix.

APPENDIX B
ESTIMATION OF STATIONARY SOURCE AIR POLLUTION CONTROL COSTS

This appendix provides documentation for the derivation of the private, state, and local stationary source air pollution control costs by funding source, and the private air costs by pollutant, which are presented in Chapter 3.

B.1. DATA SOURCES

Private, state, and local stationary source air pollution control costs were derived from two sources:

- A series of articles entitled, "Pollution Abatement and Control Expenditures" published annually in the *Survey of Current Business* by the Bureau of Economic Analysis (BEA), U.S. Department of Commerce. (This source is hereafter referred to as the "BEA data"); and

- A series of articles entitled, "Pollution Abatement Costs and Expenditures" published annually in the *Current Industrial Reports* by the Bureau of the Census, U.S. Department of Commerce. (This source is hereafter referred to as the "Census data.")

The BEA data contains stationary source air pollution control capital costs (capital account) and O&M costs (current account) for private manufacturing and non-manufacturing establishments, as well as state and local governments over each of the years 1972-1987. The BEA data served as the primary data source for the air pollution control costs by funding source presented in Chapter 3. Table B-1 presents the BEA estimates for private costs in current dollars, and Table B-9 shows state and local costs.

The Census data, on the other hand, is much more limited. Census gathered costs over the years 1973-1986 for private manufacturing establishments only. Additionally, the Census data contains capital costs but not O&M costs. The one feature of the Census data that makes it useful for the purposes of this report is that it breaks down air costs by pollutant controlled, which the BEA does not. Table B-2 shows the Census manufacturing capital costs estimates by pollutant in current dollars. The use of the Census data to break down total private air costs by pollutant is discussed below.

B.2. PRIVATE COSTS BY POLLUTANT

To break down private costs by pollutant controlled, several manipulations of both the BEA and Census data were required. First, the Census data needed to be standardized due to inconsistency in the way Census reports costs by pollutant for different years. For years 1983-1986, costs are broken down into the following pollutant categories:

- Particulates;
- Sulfur oxides;

- Nitrogen oxides and carbon monoxide;
- Hydrocarbons (volatile organic compounds);
- Lead;
- Toxics; and
- Other pollutants.

For years prior to 1983, however, costs are broken out separately for only two of the above pollutants—particulates and sulfur oxides. Two other categories are also included, but both of these combine costs for more than one pollutant. One category includes combined costs for nitrogen oxides, hydrocarbons, and carbon monoxide; the other includes costs for heavy metals, radioactive and toxic substances, and other pollutants.

For the purposes of this report, we wished to show costs for each year over the period 1972-1987 broken down by each of the seven pollutant categories provided by the Census data on manufacturing capital costs for years 1983-1986. In order to do this, we calculated the relative shares of total year 1983 manufacturing capital costs accounted for by each of the individual pollutants within each of the two categories that combine costs for more than one pollutant. These relative shares were then applied to total costs for each category of combined pollutant costs in previous years to calculate costs for individual pollutants in years prior to 1983. This method is summarized in Table B-2; the resulting capital cost estimates by pollutant for manufacturing industries (in current dollars) are presented in Table B-3.

A second manipulation of the data was required to derive costs by pollutant for non-manufacturing industries, which are not provided by the Census data. To do this, we assumed that the proportion of total non-manufacturing air capital costs (from the BEA data) accounted for by each of the seven pollutants corresponds to that given by the Census data for manufacturing industries over each of the years 1972-1987. The factors used in this derivation are presented in Table B-8. The resulting estimates of total private capital costs by pollutant are presented in Table B-4 (current dollars) and Table B-5 (constant 1986 dollars).

A final adjustment was required to show O&M costs by pollutant, which were not reported by either of the data sources. To do this, we assumed that the proportion of total O&M costs accounted for by each pollutant corresponds to that given by our calculations for total capital costs in each respective year. This enabled us to calculate O&M costs by pollutant for total private stationary source air costs for each year over the period 1972-1987. The resulting estimates of private O&M costs by pollutant are shown in Table B-6 (current dollars) and Table B-7 (constant 1986 dollars).

Due to the assumptions needed to produce a consistent set of private costs for different pollutants, the estimates of costs broken down by pollutant controlled should be viewed as highly speculative.

B.3. STATE AND LOCAL COSTS

State and local stationary source air pollution control costs are presented in Table B-9 (constant dollars) and Table B-10 (current dollars). These were derived from the BEA data. The data sources did not include any information on state and local costs broken down by pollutant, so no such estimates are presented in this report.

Table B-1: PRIVATE EXPENDITURES FOR AIR POLLUTION CONTROL

(millions of current dollars)

Line	Source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1	CAPITAL EXPENDITURES																
2	Plant & Equip Expend	2,172	2,968	3,328	3,914	3,798	3,811	3,977	4,613	5,051	5,135	5,086	4,155	4,282	4,141	4,090	4,179
3	OPERATING EXPENDITURES																
4	Pollution Abatement																
5	Manufacturing Estabs	772	812	960	1,200	1,508	1,804	2,038	2,337	2,709	3,068	2,832					
6	Priv Owned Elec Utils	279	361	593	633	633	779	944	1,382	1,780	1,851	1,838					
7	Other Nonmanufacturing	213	234	286	362	466	580	670	780	931	1,069	1,004					
8	Total Pollution Abatement	1,264	1,407	1,839	2,195	2,607	3,163	3,652	4,499	5,420	5,988	5,674	6,149	6,690	6,997	7,072	7,763
9	Research and Development	411	451	492	466	543	654	789	924	869	852	912	1,315	1,359	1,427	1,499	1,574
10	Total Private Operating	1,675	1,858	2,331	2,661	3,150	3,817	4,441	5,423	6,289	6,840	6,586	7,464	8,049	8,424	8,571	9,337

Footnotes for Table B-1 by Line

1972-1982 Figures from *Survey of Current Business*, July 1986
2 Business, on capital account, plant and equipment expenditures, Table 10, line 4
5 Business, on current account, private, manufacturing establishments, Table 10, line 10
6 Business, on current account, private, privately owned electric utility establishments, Table 10, line 11
7 Business, on current account, private, other nonmanufacturing establishments, Table 10, line 12
8 Sum of lines 5, 6, and 7
9 Pollution abatement and control, research and development, private, Table 9, line 20
10 Sum of lines 8 and 9

1983-1987 Figures from *Survey of Current Business*, June 1989
2 Business, on capital account, pant and equipment expenditures, Table 7, no line number
5 Line 8 consists of manufacturing companies, privately and cooperatively owned electric utilities, and other nonmanufacturing companies
6 Line 8 consists of manufacturing companies, privately and cooperatively owned electric utilities, and other nonmanufacturing companies
7 Line 8 consists of manufacturing companies, privately and cooperatively owned electric utilities, and other nonmanufacturing companies
8 Business, on current account, private, operation of plant and equipment, Table 7, no line number
9 Pollution abatement and control, research and development, private, Table 6, line 20
10 Sum of lines 8 and 9

Table B-2: PRIVATE MANUFACTURING CAPITAL EXPENDITURES BY POLLUTANT

(millions of current dollars)

Line Pollutant	Factors	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1 Particulates		N/A	836	1,074	1,299	1,044	983	1,056	1,191	1,114	1,181	851	453	497	579	541	N/A
2 Sulfur Oxides		N/A	312	438	503	370	290	288	311	329	338	456	247	176	122	177	N/A
3 NOx and CO	0.248	N/A	163	234	272	237	236	339	383	496	496	348	53	34	49	64	N/A
4 Hydrocarbons/VOCs	0.752	N/A	*	*	*	*	*	*	*	*	*	*	161	195	355	493	N/A
5 Lead	0.073	N/A	*	*	*	*	*	*	*	*	*	*	8	10	48	50	N/A
6 Hazardous	0.252	N/A	*	*	*	*	*	*	*	*	*	*	29	46	38	50	N/A
7 Other	0.675	N/A	107	202	162	148	142	170	187	167	175	173	76	80	100	88	N/A
8 Total Private Mfg			1,418	1,948	2,236	1,798	1,652	1,854	2,072	2,105	2,190	1,828	1,027	1,037	1,292	1,463	N/A

Footnotes for Table B-2

Private capital expenditures for air pollution control taken from census data, U.S. Department of Commerce, Bureau of the Census, *Pollution Abatement Costs and Expenditures* (PACE) for the years 1973-1986. Census data were not published prior to 1973. Survey for 1987 was not taken.

1973-1982 figures were taken from Table 2A, column "Capital expenditures, by air pollutants abated" (1979 figures are from Table 3A):
Line 1: sub-column "Particulates"
Line 2: sub-column "Sulfur oxides"
Line 3: sub-column "Nitrogen oxides, hydrocarbons, carbon monoxide"
Line 4: Not included in census data
Line 5: Not included in census data
Line 6: Not included in census data
Line 7: sub-column "Heavy metals, radioactive and toxic substances, and other"

1983-1986 figures were taken from Table 3A, column "Air," sub-column "By type of pollutant abated":
Line 1: sub-column "Particulates"
Line 2: sub-column "Sulfur oxides"
Line 3: sub-column "Nitrogen oxides and carbon monoxide"
Line 4: sub-column "Hydrocarbon volatile organic compounds"
Line 5: sub-column "Lead"
Line 6: sub-column "Hazardous air pollutants"
Line 7: sub-column "Other"

Factors were obtained in the following manner:

Line 3: Line 3 (1983) divided by the sum of Lines 3 and 4 (1983)
Line 4: Line 4 (1983) divided by the sum of Lines 3 and 4 (1983)
Line 5: Line 5 (1983) divided by the sum of Lines 5 - 7 (1983)
Line 6: Line 6 (1983) divided by the sum of Lines 5 - 7 (1983)
Line 7: Line 7 (1983) divided by the sum of Lines 5 - 7 (1983)

[a] Census data were not collected for 1987.

Table B-3: PRIVATE MANUFACTURING CAPITAL EXPENDITURES BY POLLUTANT

(millions of current dollars)

Line Pollutant	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1 Particulates	N/A	836	1,074	1,299	1,044	983	1,056	1,191	1,114	1,181	851	453	497	579	541	N/A
2 Sulfur Oxides	N/A	312	438	503	370	290	288	311	329	338	456	247	176	122	177	N/A
3 NOx and CO	N/A	40	58	68	59	59	84	95	123	123	87	53	34	49	64	N/A
4 Hydrocarbons/VOCs	N/A	122	175	204	178	177	255	288	373	373	262	161	195	355	493	N/A
5 Lead	N/A	8	15	12	11	10	13	14	12	13	13	8	10	48	50	N/A
6 Hazardous	N/A	27	51	41	37	36	43	47	42	44	44	29	46	38	50	N/A
7 Other	N/A	72	136	109	100	96	115	126	113	118	117	76	80	100	88	N/A
8 Total Private Mfg	N/A	1,418	1,948	2,236	1,798	1,652	1,854	2,072	2,105	2,190	1,828	1,027	1,037	1,292	1,463	N/A

Footnotes for Table B-3

Table B-3 is a recapitulation of Table B-2 with the following exceptions:

Figures for 1973-1982 from Line 3, Table B-2, were distributed between Lines 3 and 4, Table B-3
Line 3, Table B-3, was obtained by multiplying Line 3, Table B-2, by .248 (the factor in Line 3, Table B-2, column "Factors")
Line 4, Table B-3, was obtained by multiplying Line 3, Table B-2, by .752 (the factor in Line 4, Table B-2, column "Factors")

Figures for 1973-1982 from Line 7, Table B-2, were distributed among Lines 5, 6 and 7, Table B-3
Line 5, Table B-3, was obtained by multiplying Line 7, Table B-2, by .073 (the factor in Line 5, Table B-2, column "Factors")
Line 6, Table B-3, was obtained by multiplying Line 7, Table B-2, by .252 (the factor in Line 6, Table B-2, column "Factors")
Line 7, Table B-3, was obtained by multiplying Line 7, Table B-2, by .675 (the factor in Line 7, Table B-2, column "Factors")

Table B-4: TOTAL PRIVATE CAPITAL EXPENDITURES BY POLLUTANT

(millions of current dollars)

Pollutant	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1 Particulates	N/A	1,751	1,835	2,274	2,205	2,269	2,265	2,652	2,672	2,770	2,367	1,834	2,053	1,858	1,513	1,546
2 Sulfur Oxides	N/A	653	749	880	781	670	619	693	789	792	1,268	1,000	727	391	496	506
3 NOx and CO	N/A	85	99	118	124	135	181	212	296	289	241	215	138	156	178	182
4 Hydrocarbons/VOCs	N/A	256	300	358	375	409	547	641	894	874	728	650	803	1,139	1,378	1,407
5 Lead	N/A	16	25	21	23	24	27	30	29	30	35	34	41	154	141	144
6 Hazardous	N/A	56	87	71	79	83	92	105	101	103	121	115	188	122	139	142
7 Other	N/A	151	233	191	211	222	247	280	270	276	325	309	332	322	246	251
8 Total Private Capital	2,172	2,968	3,328	3,914	3,798	3,811	3,977	4,613	5,051	5,135	5,086	4,155	4,282	4,141	4,090	4,179
9 Total Priv Cap (Checksum)	N/A	2,968	3,328	3,914	3,798	3,811	3,977	4,613	5,051	5,135	5,086	4,155	4,282	4,141	4,090	4,179

Footnotes for Table B-4

Total Private Capital expenditures (Line 8, Table B-4) were multiplied by factors in Table B-8 to distribute expenditures among pollutants in direct ratio to the percentage of expenditure per pollutant from census data.

Table B-5: TOTAL PRIVATE CAPITAL EXPENDITURES BY POLLUTANT

(millions of 1986 dollars)

Pollutant	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1 Particulates	N/A	3,911	3,640	4,058	3,708	3,608	3,364	3,608	3,327	3,161	2,563	1,953	2,126	1,887	1,513	1,525
2 Sulfur Oxides	N/A	1,458	1,485	1,571	1,314	1,065	919	943	982	904	1,374	1,064	752	397	496	499
3 NOx and CO	N/A	189	197	211	209	215	269	288	368	330	261	229	143	158	178	179
4 Hydrocarbons/VOCs	N/A	571	595	638	631	651	813	872	1,113	997	789	692	832	1,157	1,378	1,388
5 Lead	N/A	37	50	37	39	38	40	41	37	34	38	36	42	156	141	142
6 Hazardous	N/A	126	173	127	132	132	137	142	126	118	131	123	195	123	139	140
7 Other	N/A	336	462	341	354	352	366	381	336	315	352	329	343	327	246	248
8 Total Private Capital	4,994	6,623	6,601	6,983	6,387	6,061	5,908	6,276	6,288	5,860	5,508	4,425	4,433	4,207	4,090	4,122
9 Fixed-weighted indexes	0.435	0.448	0.504	0.560	0.595	0.629	0.673	0.735	0.803	0.876	0.923	0.939	0.966	0.984	1.000	1.014

Footnotes for Table B-5

Figures in Table B-5 were indexed to 1986 dollars by dividing each figure in Table B-4 by the fixed-weighted price index for the given year (Line 9, Table B-5).

Table B-6: TOTAL PRIVATE OPERATING EXPENDITURES BY POLLUTANT

(millions of current dollars)

Pollutant	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1 Particulates	N/A	1,096	1,285	1,546	1,829	2,272	2,529	3,117	3,327	3,690	3,065	3,294	3,859	3,779	3,171	3,454
2 Sulfur Oxides	N/A	409	524	599	648	671	691	815	982	1,056	1,642	1,796	1,366	796	1,038	1,131
3 NOx and CO	N/A	53	69	80	103	136	202	249	368	385	312	386	260	316	373	406
4 Hydrocarbons/VOCs	N/A	160	210	243	311	410	611	754	1,113	1,164	943	1,167	1,510	2,317	2,887	3,145
5 Lead	N/A	10	18	14	19	24	30	36	37	40	46	60	77	313	295	322
6 Hazardous	N/A	35	61	48	65	83	103	123	126	137	157	207	353	247	292	318
7 Other	N/A	94	163	130	175	222	275	329	336	368	421	554	624	655	515	561
8 Total Private Operating	1,675	1,858	2,331	2,661	3,150	3,817	4,441	5,423	6,289	6,840	6,586	7,464	8,049	8,424	8,571	9,337
9 Total Priv Oper (Checksum)	N/A	1,858	2,331	2,661	3,150	3,817	4,441	5,423	6,289	6,840	6,586	7,464	8,049	8,424	8,571	9,337

Footnotes for Table B-6

Factors in Table B-8 were applied to Total Private Operating Expenditures (BEA data, Line 8, Table B-6), to distribute expenditures among pollutants in direct ratio to the percentage of expenditure per pollutant from census data. This was accomplished by multiplying annual Total Private Operating (Line 8, Table B-6) times factors per pollutant in Table B-8.

Table B-7: TOTAL PRIVATE OPERATING EXPENDITURES BY POLLUTANT

(millions of 1986 dollars)

Pollutant	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1 Particulates	N/A	3,240	2,768	3,047	3,446	3,944	4,096	4,240	3,742	3,743	3,043	3,235	3,699	3,550	3,171	3,400
2 Sulfur Oxides	N/A	1,208	1 129	1,179	1,221	1,164	1,119	1,108	1,105	1,071	1,631	1,764	1,309	748	1,038	1,113
3 NOx and CO	N/A	157	150	158	194	235	327	339	414	390	310	379	249	297	373	400
4 Hydrocarbons/VOCs	N/A	473	452	479	587	712	990	1,025	1,252	1,181	937	1,146	1,448	2,177	2,887	3,095
5 Lead	N/A	30	38	28	36	42	49	49	41	41	45	59	74	294	295	317
6 Hazardous	N/A	104	131	95	123	144	167	167	141	139	156	203	339	232	292	313
7 Other	N/A	279	352	256	329	385	446	448	378	373	418	545	598	615	515	552
8 Total Private Operating	5,400	5,491	5,021	5,243	5,935	6,626	7,194	7,377	7,072	6,938	6,540	7,331	7,715	7,914	8,571	9,189
9 Fixed-weighted indexes	0.310	0.338	0.464	0.508	0.531	0.576	0.617	0.735	0.889	0.986	1.007	1.018	1.043	1.064	1.000	1.016

Footnotes for Table B-7

Figures in Table B-7 were indexed to 1986 dollars by dividing each figure in Table B-6 by the fixed-weighted price index for the given year (Line 9, Table B-7).

Table B-8: FACTORS USED TO DISTRIBUTE TOTALS ACROSS POLLUTANTS

Pollutant	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1 Particulates	N/A	0.590	0.551	0.581	0.581	0.595	0.569	0.575	0.529	0.539	0.465	0.441	0.479	0.449	0.370	0.370
2 Sulfur Oxides	N/A	0.220	0.225	0.225	0.206	0.176	0.156	0.150	0.156	0.154	0.249	0.241	0.170	0.094	0.121	0.121
3 NOx and CO	N/A	0.029	0.030	0.030	0.033	0.036	0.045	0.046	0.059	0.056	0.047	0.052	0.032	0.038	0.043	0.043
4 Hydrocarbons/VOCs	N/A	0.086	0.090	0.091	0.099	0.107	0.138	0.139	0.177	0.170	0.143	0.156	0.188	0.275	0.337	0.337
5 Lead	N/A	0.006	0.008	0.005	0.006	0.006	0.007	0.007	0.006	0.006	0.007	0.008	0.010	0.037	0.034	0.034
6 Hazardous	N/A	0.019	0.026	0.018	0.021	0.022	0.023	0.023	0.020	0.020	0.024	0.028	0.044	0.029	0.034	0.034
7 Other	N/A	0.051	0.070	0.049	0.055	0.058	0.062	0.061	0.053	0.054	0.064	0.074	0.077	0.078	0.060	0.060
8 Total	N/A	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

Footnotes for Table B-8

1 Particulates (Line 1, Table B-3) divided by Total Private Mfg (Line 8, Table B-3)
2 Sulfur Oxides (Line 2, Table B-3) divided by Total Private Mfg (Line 8, Table B-3)
3 NOx and CO (Line 3, Table B-3) divided by Total Private Mfg (Line 8, Table B-3)
3 Hydrocarbons/VOCs (Line 4, Table B-3) divided by Total Private Mfg (Line 8, Table B-3)
4 Lead (Line 5, Table B-3) divided by Total Private Mfg (Line 8, Table B-3)
1 Hazardous figures (Line 6, Table B-3) divided by Total Private Mfg (Line 8, Table B-3)
1 Other (Line 7, Table B-3) divided by Total Private Mfg (Line 8, Table B-3)

Figures for 1987 were calculated in the same proportions as 1986 since a 1987 survey was not conducted.

Table B-9: STATE AND LOCAL AIR POLLUTION CONTROL COSTS

(millions of current dollars)

Line	Source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
	State & Local Capital																
1	Publ-owned elec utilities	63	82	104	102	156	197	205	285	398	451	508	422	416	328	312	277
	State & Local Operating																
2	Pollution abatement	0	0	0	1	1	1	0	0	0	0	0	4	14	12	14	15
3	Regulation & monitoring	95	115	131	139	135	161	183	200	207	226	230	239	250	250	307	300
4	Research & development	17	6	7	8	6	7	8	7	5	0	2	6	4	3	4	2
5	Publ-owned elec utilities	23	29	56	45	58	60	72	106	148	135	141	143	147	189	182	192
6	Total St & Local O&M	135	150	194	193	200	229	263	313	360	361	373	392	415	454	507	509
7	Fixed-weighted indexes	0.393	0.418	0.493	0.555	0.591	0.631	0.674	0.740	0.817	0.890	0.943	0.956	0.989	0.998	1.000	1.004

Footnotes for Table B-9

1972-1982 Figures from *Survey of Current Business*, July 1986

1 Government, government enterprise fixed capital, publicly owned electric utilities, Table 10, line 27
2 Pollution abatement and control, pollution abatement, government, state and local, Table 9, line 14
3 Pollution abatement and control, regulation and monitoring, state and local, Table 9, line 18
4 Pollution abatement and control, research and development, state and local, Table 9, line 22
5 Business, on current account, government enterprise, publicly owned electric utilities, Table 10, line 16
6 Sum of lines 2 - 5

1983-1987 Figures from *Survey of Current Business*, June 1989

1 Government, government enterprise fixed capital, publicly owned electric utilities, Table 7, no line number
2 Pollution abatement and control, pollution abatement, government, state and local, Table 7, no line number
3 Pollution abatement and control, regulation and monitoring, state and local, Table 7, no line number
4 Pollution abatement and control, research and development, state and local, Table 7, no line number
5 Business, on current account, government enterprise, publicly owned electric utilities, Table 7, no line number
6 Sum of lines 2 - 5

Table B-10: STATE AND LOCAL AIR POLLUTION CONTROL COSTS

(millions of 1986 dollars)

Line	Source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
	State & Local Capital																
1	Publ-owned elec utilities	160	196	211	184	264	312	304	385	487	507	539	442	421	329	312	276
	State & Local Operating																
2	Pollution abatement	0	0	0	2	2	2	0	0	0	0	0	4	14	12	14	15
3	Regulation & monitoring	242	275	266	250	228	255	272	270	253	254	244	250	253	250	307	299
4	Research & development	43	14	14	14	10	11	12	9	6	0	2	6	4	3	4	2
5	Publ-owned elec utilities	59	69	114	81	98	95	107	143	181	152	150	150	149	189	182	191
6	Total St & Local O&M	343	359	394	348	338	363	390	423	441	406	396	410	420	455	507	507

Footnotes for Table B-10

Figures in Table B-10 were indexed to 1986 dollars by dividing each figure in Table B-9 by the fixed-weighted price index for the given year (Line 7, Table B-9).

APPENDIX C
ESTIMATION OF MOBILE SOURCE EMISSIONS CONTROL COSTS

This appendix provides background documentation and component costs for the mobile source air pollution control cost estimates listed and discussed in Chapter 3. The derivation of the cost estimates is discussed below; this is followed by a set of data tables C-1 through C-17 that show the various components of mobile source costs.

The mobile source costs were derived using a special EPA analysis instead of the Commerce Department "Pollution Abatement and Control Expenditure" (PACE) reports. The data sources used in the cost derivations include EPA Regulatory Impact Analyses (RIAs) and other EPA reports. These are listed at the end of the discussion that follows. The estimated mobile source costs represent the direct pollution control compliance costs—both capital and operation and maintenance costs—borne by purchasers and users of mobile sources equipped with such controls. Total capital and costs for all mobile sources are shown in Table C-1.

C.1. GENERAL METHODOLOGY

The basic approach used to estimate the costs of controlling pollution emissions from motor vehicles was to calculate the purchase price and operation and maintenance (O&M) cost premiums associated with vehicles equipped with pollution abatement controls over the costs for vehicles not equipped with such controls. Calculations of both capital expenditures and O&M costs were made for each of several vehicle classes. Capital expenditures were annualized using three different capital amortization rates—three, seven, and ten percent, and an assumed capital life of 10 years. Annualized capital costs were added to annual O&M costs to calculated total annualized costs. Only the seven percent annualization is shown in this appendix. Other annualized costs are shown in Tables 3-3C through 3-3H.

The methodology used to project future costs for existing mobile source regulations differed from the projection methodology used for most other programs included in this report. Rather than using regression models to extrapolate historical cost data, future mobile source costs were calculated by multiplying unit vehicle pollution control hardware cost and O&M cost estimates by estimates of projected vehicle production and use levels, respectively, in future years for each vehicle class.

C.1.1. *New Regulation Costs*

The cost for new regulations that were not fully implemented by the end of 1988 were added to the projected future costs associated with established mobile source regulations. These include: oxides of nitrogen and particulate emissions tailpipe standards on light-duty trucks and heavy-duty engines; the diesel fuel sulfur content standard; and the fuel volatility rule, which is intended to limit the evaporation of volatile organics from gasoline. The costs associated with these regulations are broken out in Table C-15. These regulation costs are also broken down by the pollutants they are intended to control, which are shown in Table C-16. For regulations aimed at more than one pollutant, costs were apportioned equally between the two pollutants.

The data show that the main focus of new regulatory initiatives is on the control of precursors to ozone formation and emissions of particulate matter.

C.1.2. *Full Implementation Costs*

Costs associated with fully implementing certain existing regulations and programs are also included. These costs are associated with the additional efforts required to meet the national ambient air quality standard (NAAQS) for ozone. Table C-17 lists the mobile source measures that are included in the Administration's proposed strategy for achieving the ozone NAAQS, and the best available data on their costs. (These were obtained from Data Sources 18, 19, and 20 listed at the end of the narrative.) Since these measures are currently being debated as part of Clean Air Act amendments, they are subject to change pending final legislation.

C.2. COSTS BY VEHICLE CLASS

The mobile source analysis is organized according to the following vehicle classes in the sections listed:

C.2.1. Light-duty vehicles,
C.2.2. Trucks, and
C.2.3. Motorcycles and aircraft.

C.2.1. *Light-Duty Vehicles*

Costs for light-duty vehicles (passenger cars) are summarized in Table C-2; supporting detail is given in Table C-10. Total historical and projected future capital expenditures for all mobile source emission control are associated primarily with pollution abatement equipment on passenger cars, which comprise the bulk of all mobile sources of pollution. These capital costs reflect increasingly stringent regulatory requirements and improvements in pollution control technologies over time. Each of the following devices have been used at one time or another dating back to the Clean Air Act Amendments of 1965: air pumps, exhaust-gas recirculation valves, high altitude controls, evaporative emissions controls, and catalysts. The cost estimates for each component were computed on a per-vehicle basis by engineering cost analyses commissioned by EPA or completed in-house. The resulting per-vehicle capital costs were multiplied by vehicle production estimates to determine annual capital costs for each year.

Costs for operation and maintenance (O&M) of emission abatement devices include maintenance costs, fuel price penalty costs, and fuel consumption penalty costs. Operating costs per vehicle were multiplied by total vehicles in use to determine annual cost. Each of the three types of O&M costs are shown in Table C-2 and discussed below.

Total mobile source maintenance costs include the costs of maintaining pollution control equipment plus the cost of vehicle inspection/maintenance programs. Table C-2 shows that pollution controls have resulted in a net maintenance cost savings since 1975, the year that catalytic devices were first required on passenger vehicles. Catalysts require the use of unleaded fuel which is more beneficial for a vehicle than leaded gasoline. The use of unleaded fuels increases the longevity of exhaust systems and spark plugs, thus reducing maintenance costs. This cost savings was added to the cost of inspection/maintenance activities which includes the fee applied to every vehicle tested plus a weighted average cost of repair for those vehicles failing inspection.

The second O&M component—the fuel price penalty—reflects the price differential between unleaded and leaded gasoline. Historically, the price of unleaded fuel has been two to 3.5 cents per gallon higher than the price of leaded fuel. However, EPA estimates that by 1990 no significant price differential will exist between unleaded and leaded fuels; thus, no operating costs will be associated with fuel price penalty in years 1990-2000. The third component of mobile source O&M costs—fuel economy penalty—exists because vehicles with pollution control equipment get lower gas mileage than comparable vehicles without such controls. As shown in Tables C-2, this fuel economy penalty comprised the largest component of total operating costs until the late 1970s, although it declined over the period 1975-1980 as cars became more fuel efficient. EPA estimates that in 1982, the penalty became a net benefit as the change to a three-way catalyst in 1980 eventually made vehicles with pollution controls more fuel efficient than vehicles not equipped with controls.

As shown in Table C-2, the estimated switch in the maintenance and fuel economy O&M components from positive to negative costs leads to an overall net mobile source O&M cost savings in the year 1989. Savings from these two components coupled with the elimination of the fuel price penalty in 1990, are estimated to increase overall O&M savings significantly over the period 1990-2000. This greatly lowers the estimates of total annualized costs for mobile sources. It should be noted that other sources of mobile source cost estimates—such as the Commerce Department PACE reports—do not recognize any beneficial effects of pollution control devices on O&M costs, and thus report significantly higher overall costs for mobile source pollution control.

The only new regulation expected to affect passenger car costs is the fuel volatility rule. The cost for this rule was subtracted from projected future O&M cost savings for light-duty vehicles.

C.2.2. *Trucks*

The discussion of trucks is divided into five classes based on gross vehicle weight. They are discussed in the sections listed:

C.2.2.1. Light-duty trucks weighing 0-6,000 pounds (LDT1) and light-duty trucks weighing 6,000-8,500 pounds (LDT2),

C.2.2.2. Heavy-duty gasoline engine vehicles weighing 8,500-10,000 pounds (HDGE1),

C.2.2.3. Heavy-duty gasoline engine vehicles weighing more than 10,000 pounds (HDGE2), and

C.2.2.4. Heavy-duty diesel engine vehicles weighing more than 10,000 pounds (HDDE).

Capital and O&M cost calculations for trucks parallel those for light-duty vehicles, with the primary differences being: 1) the schedule for implementation of regulatory requirements; and 2) the unit costs for pollution abatement devices. Differences specific to particular classes of trucks are discussed below.

C.2.2.1. LDT1 and LDT2

The control costs for LDT1 and LDT2 are summarized in Tables C-3 and C-4; supporting detail is given in Tables C-11 and C-12. These classes of trucks are subject to two new regulations: the fuel volatility rule and the NOx truck standard. The NOx standard will result in additional capital costs beginning with the 1988 model year.

C.2.2.2. HDGE1

The control costs for HDGE1 are presented in Table C-5; supporting detail is given in Table C-13. While evaporative emission controls existed for HDGE1 as far back as 1972, the first large cost increase occurred with the 1979 model year as emission control requirements were strengthened for the first time. Initiatives to control hydrocarbons and carbon monoxide were enhanced again in 1985 and 1986, resulting in sharp increases in control costs. New regulations affecting HDGE1 include the fuel volatility rule and the NOx truck standard.

C.2.2.3. HDGE2

The control costs for HDGE2 are presented in Table C-6; supporting detail is given in Table C-14. Calculations for HDGE2 parallel those for HDGE1 except that no fuel price penalty was quantifiable for HDGE2. The fuel volatility rule and the NOx truck standard are the two new regulations affecting this vehicle class.

C.2.2.4. HDDE

The control costs for HDDE are presented in Table C-17. Capital costs resulting from emission control standards for HDDE began with the 1979 model year and increased with the 1985 model year, due to more stringent standards for hydrocarbons and carbon monoxide. No incremental maintenance costs are attributed to pollution control requirements for diesel engines.

Many of the new regulations scheduled for motor vehicles apply to HDDE vehicles. The diesel fuel rule restricts the sulfur content in diesel fuel to .05 percent beginning in 1994. EPA has estimated the cost to de-sulfur fuel is approximately 1.8 cents per gallon. This unit cost was multiplied by fleet fuel consumption estimates to derive annual cost estimates for HDDE. (See Data Source 16.)

The NOx and particulate matter (PM) standards affecting HDDE will result in five hardware cost additions between 1988 and 1994. Increased costs for fuel economy penalty and maintenance are also associated with the PM portion of the standards. Fuel economy penalties were derived from engineering studies that factored in annual diesel fuel consumption rates and an assumed diesel fuel price of $1.00 per gallon.

C.2.3. *Motorcycles and Aircraft*

The control costs for motorcycles are summarized in Table C-8; aircraft costs are presented in Table C-9. For motorcycles, the control of hydrocarbons and carbon monoxide emissions began with the 1978 model year. Maintenance costs have not been quantified and a fuel price penalty does not apply. For aircraft, emission controls began in 1975, and incremental maintenance costs were quantifiable. However, these maintenance costs are offset by fuel economy savings that accrue from improved combustion efficiency at idle.

C.3. DATA SOURCES

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4. Gray, Charles L., "Updated Cost Estimates of Controlling HC Emissions From Mobile Sources", U.S. EPA Emissions Control Technology Division, Memorandum. November 28, 1983.

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6. U.S. EPA, *Cost and Economic Assessment of Alternative National Ambient Air Quality Standards for Carbon Monoxide (Revised)*, OAQPS, EPA-450/5-85-006, July 1985.

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15. U.S. EPA, *Inspection and Maintenance Program Implementation Summary*, Office of Mobile Sources, Ann Arbor, MI, January 1987.

16. U.S. EPA, *Draft Regulatory Impact Analysis - Control of Sulfur and Aromatics Contents of On-Highway Diesel Fuel*, Office of Air and Radiation, Office of Mobile Sources, July 1989.

17. Federal Register, Notice of Final Rulemaking, "Volatility Regulations for Gasoline and Alcohol Blends Sold in Calendar Year 1989 and Beyond", March 22, 1989.

18. U.S. EPA, *Ozone Nonattainment Analysis: A Comparison of Bills An Interim Report*, Prepared for the Office of Air and Radiation, by E.H. Pechan and Associates, January 1990.

19. Title II-Provisions Relating to Mobile Sources, H.R. 3030, 101st Congress, 1st Session, July 27, 1989.

20. U.S. EPA, *Analysis of Costs of Hazardous Air Pollutant Controls Under Administration Bill, H.R. 2585, and S. 816.*, Prepared by Energy and Environmental Analysis, Inc. for the Office of Policy Analysis and Review, the Office of Air and Radiation, and the Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, October 27, 1989.

Table C-1: TOTAL CONTROL COSTS FOR ALL VEHICLE CLASSES

(millions of 1986 dollars)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Capital Expenditure	268	564	472	2,775	3,256	3,548	3,685	4,010	3,716	4,189	4,049	4,812	6,125	6,664	6,885
2 Operating Cost	1,307	2,118	2,082	1,828	1,597	1,494	1,293	1,027	836	443	192	269	114	(3)	236

Footnotes to Table C-1 by Line

1. Represents the sum of each line 2 entry in Tables C-2 through C-9. For each vehicle class, capital expenditure is calculated on a per vehicle basis according to the vehicle hardware necessary to comply with emissions regulations. This figure is then multiplied by each year's production estimate to derive a total capital expenditure per year.

2. Represents the sum of each line 3 entry in Tables C-2 through C-9. For each vehicle class, operating cost is the sum of the following component costs: maintenance, fuel price penalty, and fuel economy penalty. Each of these components costs will be described in more detail in the footnotes to Table C-2. This sum is calculated on a per vehicle basis and is then multiplied by the total vehicles in use per year to derive total operating cost. Total vehicles in use per year accounts for 1) each year's production and 2) vehicles surviving from previous model years. See Tables C-10 through C-14 for supporting details and footnotes.

Table C-1A: TOTAL CONTROL COSTS FOR ALL VEHICLE CLASSES

(millions of 1986 dollars)

Line	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
3 Capital Expenditure	6,885	6,653	6,883	6,573	6,663	6,876	7,022	7,222	7,403	7,559	7,665	7,827	7,941	8,061	8,179
4 Existing Regs.	6,885	6,653	6,788	6,476	6,566	6,729	6,871	7,066	7,217	7,367	7,468	7,623	7,732	7,844	7,956
5 New Regs.	0	0	96	97	97	147	151	156	186	191	197	203	210	216	223
6 Operating Cost	236	238	213	(1)	(1,630)	(1,317)	(1,138)	214	274	1,168	1,919	2,692	3,444	3,481	3,355
7 Existing Regs.	236	238	213	(136)	(1,766)	(1,694)	(1,623)	(1,549)	(1,459)	(1,372)	(1,320)	(1,246)	(1,191)	(1,153)	(1,135)
8 New Regs.	0	0	0	135	135	377	484	437	388	335	318	301	282	266	249
9 Full Implementation	NA	NA	NA	NA	NA	NA	NA	1326	1345	2205	2922	3637	4353	4368	4240

Footnotes to Table C-1A by Line

3. Sum of lines 4 and 5.
4. Cost is determined using the same methodology described in line 1 of footnotes to Table C-1. Existing regulations only.
5. From Table C-15. New regulations only.
6. The sum of lines 7, 8 and 9.
7. Same methodology used in line 2 of Table C-1. Existing regulations only.
8. From Table C-15A. New regulations only.
9. From Table C-17.

Table C-2: CONTROL COSTS FOR LIGHT-DUTY VEHICLES (LDV)

(millions of 1986 dollars)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Annualized Cost at 7%	999	1,603	1,637	1,715	1,879	2,253	2,513	2,720	2,960	3,083	3,269	3,856	4,269	4,530	5,050
2 Capital Expend.	208	442	343	2,446	2,861	3,142	3,202	3,020	2,973	3,485	3,277	3,965	4,908	5,258	5,416
3 Operating Cost	962	1,504	1,489	1,220	979	908	714	493	315	(52)	(301)	(213)	(447)	(584)	(427)
4 Maint. Exp.	140	193	232	(104)	(238)	(354)	(502)	(638)	(747)	(829)	(823)	(868)	(590)	(598)	(394)
5 Fuel Price Penalty	0	0	0	125	239	384	453	495	557	590	622	692	770	880	993
6 Fuel Economy Penalty	822	1,311	1,257	1,200	979	878	763	636	505	187	(101)	(37)	(627)	(867)	(1,026)

Footnotes to Table C-2 by Line

1. Costs were annualized at 7 percent using the same methodology applied throughout this report (see sec. 1.3.1.) except that the depreciation schedule for mobile sources is 10 years.

2. Capital expenditure is calculated on a per vehicle basis and is the sum of the costs of the various hardware devices required to comply with emissions regulations. For a more detailed listing of these components see Table C-10, line 1. The sum of these costs are then multiplied by yearly production estimates to derive total expenditure. Only costs due to regulations implemented between 1972 and 1988 are considered.

3. Sum of lines 4 through 6.

4. Maintenance expenditure per vehicle (Table C-10) times total vehicles in use (Table C-10).

5. Derived by multiplying the unleaded miles driven per year (Table C-10) by the quotient of the premium in price for unleaded gasoline (Ref. 5,4) and the fuel efficiency (mpg) for a vehicle equipped with emissions controls (Ref. 5).

6. This factor is based on the fuel economy penalty per vehicle mile (Table C-10). The per mile figure is then multiplied by total miles travelled per year for all vehicles in use. This is based on each year's production (Table C-10), annual miles driven per vehicle (Ref. 8, p.H-11), and the survival rate for each model year (Ref. 2, p.26) to account for previous years' production.

Table C-2A: CONTROL COSTS FOR LIGHT-DUTY VEHICLES (LDV)

(millions of 1986 dollars)

Line	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7 Total annualized cost	5,050	5,304	5,546	5,550	4,806	5,165	5,466	5,790	5,993	6,152	6,283	6,453	6,597	6,775	6,926
8 Existing Regs.	5,050	5,304	5,546	5,550	4,704	5,063	5,466	5,790	5,993	6,152	6,283	6,453	6,597	6,775	6,926
9 New Regs.	NA	NA	NA	NA	102	102	0	0	0	0	0	0	0	0	0
10 Capital Expend.	5,416	5,105	5,199	4,865	4,957	5,049	5,141	5,280	5,372	5,463	5,504	5,595	5,639	5,683	5,727
11 Existing Regs.	5,416	5,105	5,199	4,865	4,957	5,049	5,141	5,280	5,372	5,463	5,504	5,595	5,639	5,683	5,727
12 New Regs.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13 Operating Cost	(427)	(450)	(492)	(648)	(1,774)	(1,637)	(1,600)	(1,462)	(1,325)	(1,196)	(1,077)	(976)	(894)	(833)	(790)
14 Existing Regs.	(427)	(450)	(492)	(750)	(1,876)	(1,739)	(1,600)	(1,462)	(1,325)	(1,196)	(1,077)	(976)	(894)	(833)	(790)
15 Maint. Exp.	(394)	(390)	(425)	(447)	(469)	(490)	(509)	(528)	(546)	(562)	(578)	(594)	(611)	(629)	(646)
16 Fuel Price Penalty	993	1,093	1,195	1,040	0	0	0	0	0	0	0	0	0	0	0
17 Fuel Economy Penalty	(1,026)	(1,154)	(1,261)	(1,343)	(1,407)	(1,250)	(1,091)	(934)	(779)	(633)	(499)	(382)	(283)	(204)	(144)
18 New Regs.	NA	NA	NA	102	102	102	**	**	**	**	**	**	**	**	**

Footnotes to Table C-2A by Line

7. Sum of lines 8 and 9.
8. See footnote 1, Table C-2. Existing regulations only.
9. See footnote 1, Table C-2. New regulations only.
10. Sum of lines 11 and 12.
11. See footnote 2, Table C-2. Existing regulations only.
12. See footnote 2, Table C-2. New regulations only.
13. Sum of lines 14 and 18.
14. Sum of lines 15 through 17.
15. See footnote 4, Table C-2. Existing regulations only.
16. See footnote 5, Table C-2. Existing regulations only.
17. See footnote 6, Table C-2. Existing regulations only.
18. The only regulation that qualifies as a new regulation and applies to light-duty vehicles is fuel volatility (Phase I RVP).

    The ** beginning in 1992 are used to indicate that, although phase II RVP is expected to begin in 1992, current cost estimates are included with the proposed Clean Air Act ammendment section (see Table C-17).

Table C-3: CONTROL COSTS FOR LIGHT-DUTY TRUCKS (LDT1)

(millions of 1986 dollars)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Annualized Cost	148	257	246	306	318	338	382	421	453	484	528	568	692	759	856
2 Capital Expend.	29	73	61	276	331	327	326	330	244	262	291	348	566	628	666
3 Operating Cost	143	242	222	243	208	182	180	172	170	164	170	171	224	241	291
4 Maint. Exp.	7	8	7	(3)	(9)	(10)	(16)	(21)	(25)	(28)	(21)	(23)	21	22	53
5 Fuel Price Penalty	0	0	0	22	42	60	81	95	110	119	129	140	156	180	204
6 Fuel Economy Penalty	136	234	215	224	175	132	114	98	85	73	63	54	46	40	33

All footnotes correspond to the footnotes for Table C-2. Refer to Table C-11 for supporting details.

Table C-3A: CONTROL COSTS FOR LIGHT-DUTY TRUCKS (LDT1)

(millions of 1986 dollars)

Line	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7 Total Annualized Cost	856	928	1,004	1,042	880	948	998	1,059	1,099	1,133	1,169	1,203	1,230	1,262	1,297
8 Existing Regs.	856	928	996	1,011	842	903	960	1,014	1,045	1,070	1,097	1,122	1,147	1,176	1,209
9 New Regs.	NA	NA	7	31	38	46	37	46	54	63	71	81	83	85	88
10 Capital Expend.	666	706	779	780	786	811	837	864	892	920	949	980	1,011	1,044	1,077
11 Existing Regs.	666	706	727	728	734	758	782	807	833	859	887	915	944	975	1,006
12 New Regs.	NA	NA	51	51	52	53	55	57	59	61	63	65	67	69	71
13 Operating Cost	291	309	320	295	56	46	18	7	0	(7)	(11)	(16)	(22)	(27)	(34)
14 Existing Regs.	291	309	320	278	40	30	18	7	0	(7)	(11)	(16)	(22)	(27)	(34)
15 Maint. Exp.	53	51	43	35	28	21	15	8	1	(5)	(10)	(16)	(22)	(27)	(34)
16 Fuel Price Penalty	204	230	255	225	0	0	0	0	0	0	0	0	0	0	0
17 Fuel Economy Penalty	33	28	23	18	12	9	4	(1)	(1)	(2)	(1)	0	0	0	0
18 New Regs.	NA	NA	NA	16	16	16	**	**	**	**	**	**	**	**	**

LDT1 are trucks with a gross vehicle weight between 0 and 6,000 pounds.

All footnotes correspond to the footnotes for Table C-2. Refer to Table C-11 for supporting details.

Table C-4: CONTROL COSTS FOR LIGHT-DUTY TRUCKS (LDT2)

(millions of 1986 dollars)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Annualized Cost	204	378	357	335	357	330	305	321	347	358	396	428	522	610	727
2 Capital Expend.	13	30	27	13	17	22	26	473	291	249	290	312	507	562	596
3 Operating Cost	203	372	347	323	343	313	284	233	218	194	193	185	211	220	256
4 Maint. Exp.	11	16	20	25	30	40	47	(11)	(21)	(29)	(27)	(34)	(13)	(17)	2
5 Fuel Price Penalty	0	0	0	0	0	0	0	39	62	71	89	106	128	155	184
6 Fuel Economy Penalty	192	356	327	298	313	273	237	205	177	152	131	113	96	82	69

All footnotes correspond to the footnotes for Table C-2. Refer to Table C-12 for supporting details.

Table C-4A: CONTROL COSTS FOR LIGHT-DUTY TRUCKS (LDT2)

(millions of 1986 dollars)

Line Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7 Total Annualized Cost	727	822	918	916	734	780	809	851	878	901	922	946	968	996	1,027
8 Existing Regs.	727	822	913	893	706	748	787	825	847	865	880	899	920	946	975
9 New Regs.	NA	NA	4	23	27	32	22	27	31	37	42	47	49	50	52
10 Capital Expend.	596	614	655	669	662	705	728	751	775	800	826	852	879	907	936
11 Existing Regs.	596	614	626	639	632	673	695	718	741	764	789	814	840	867	894
12 New Regs.	NA	NA	29	30	30	32	33	34	35	36	37	38	39	41	42
13 Operating Cost	256	267	273	244	9	(10)	(43)	(63)	(74)	(85)	(97)	(106)	(115)	(121)	(129)
14 Existing Regs.	256	267	273	229	(6)	(24)	(43)	(63)	(74)	(85)	(97)	(106)	(115)	(121)	(129)
15 Maint. Exp.	2	(5)	(16)	(27)	(37)	(47)	(57)	(67)	(77)	(87)	(97)	(106)	(115)	(121)	(129)
16 Fuel Price Penalty	184	213	240	216	0	0	0	0	0	0	0	0	0	0	0
17 Fuel Economy Penalty	69	59	49	40	31	23	15	5	4	2	0	0	0	0	0
18 New Regs.	NA	NA	NA	15	15	15	**	**	**	**	**	**	**	**	**

LDT2 consists of trucks with a gross vehicle weight between 6,000 and 8,500 pounds.

All footnotes correspond to the footnotes for Table C-2A. Refer to Table C-12A for supporting details.

Table C-5: CONTROL COSTS FOR HEAVY-DUTY GASOLINE ENGINES (HDGE1)

(millions of 1986 dollars)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Annualized Cost	2	3	9	13	22	33	47	63	70	73	72	73	76	78	83
2 Capital Expend.	5	6	12	10	14	16	18	26	16	14	12	13	17	35	39
3 Operating Cost	1	2	6	8	16	24	36	48	52	53	52	52	53	53	54
4 Maint. Exp.	1	2	2	2	3	3	4	4	4	4	4	4	4	0	1
5 Fuel Price Penalty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6 Fuel Economy Penalty	0	0	3	6	13	21	32	44	48	50	48	48	50	52	53

All footnotes correspond to the footnotes for Table C-2. Refer to Table C-13 for supporting details.

Table C-5A: CONTROL COSTS FOR HEAVY-DUTY GASOLINE ENGINES (HDGE1)

(millions of 1936 dollars)

Line	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7 Total Annualized Cost	83	93	104	112	99	92	87	84	83	81	80	77	75	73	72
8 Existing Regs.	83	93	104	110	97	91	86	83	82	80	79	75	73	72	71
9 New Regs.	NA	NA	0	2	2	2	1	1	1	1	1	1	1	1	1
10 Capital Expend.	39	61	63	65	65	68	69	71	74	76	78	81	83	86	88
11 Existing Regs.	39	61	62	65	65	67	68	71	73	75	77	80	82	84	87
12 New Regs.	NA	NA	1	1	1	1	1	1	1	1	1	1	1	1	1
13 Operating Cost	54	58	62	64	44	30	16	6	(4)	(12)	(18)	(24)	(29)	(33)	(37)
14 Existing Regs.	54	58	62	63	43	29	16	6	(4)	(12)	(18)	(24)	(29)	(33)	(37)
15 Maint. Exp.	1	(3)	(8)	(12)	(16)	(19)	(22)	(25)	(28)	(31)	(33)	(36)	(38)	(40)	(42)
16 Fuel Price Penalty	0	7	15	18	0	0	0	0	0	0	0	0	0	0	0
17 Fuel Economy Penalty	53	54	55	57	59	48	39	31	24	19	15	12	9	7	5
18 New Regs.	NA	NA	NA	1	1	1	**	**	**	**	**	**	**	**	**

HDGE1 consists of trucks with a gross vehicle weight between 8,500 and 10,000 pounds.

All footnotes correspond to the footnotes for Table C-2A. Refer to Table C-13A for supporting details.

Table C-6: CONTROL COSTS FOR HEAVY-DUTY GASOLINE ENGINES (HDGE2)

(millions of 1986 dollars)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Annualized Cost	6	9	37	57	81	102	128	149	160	159	151	146	144	141	142
2 Capital Expend.	14	14	30	24	20	20	24	31	20	12	10	11	14	30	33
3 Operating Cost	4	5	29	46	66	85	107	124	133	130	122	117	117	114	114
4 Maint. Exp.	4	5	6	6	7	7	7	7	7	7	6	6	5	0	1
5 Fuel Price Penalty	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6 Fuel Economy Penalty	0	0	23	39	60	78	100	116	126	123	116	112	112	114	113

Footnotes correspond to the footnotes for Table C-2, with the following exceptions:

5. Data not available to compute a fuel price penalty for this vehicle class.

Refer to Table C-14 for supporting details.

Table C-6A: CONTROL COSTS FOR HEAVY-DUTY GASOLINE ENGINES (HDGE2)

(millions of 1986 dollars)

Line	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7 Total Annualized Cost	142	143	144	147	151	132	115	103	93	85	49	49	49	50	50
8 Existing Regs.	142	143	144	145	149	130	114	102	92	84	48	48	48	48	49
9 New Regs.	NA	NA	0	2	2	2	1	1	1	1	1	1	1	1	1
10 Capital Expend.	33	48	50	52	52	53	55	56	58	60	62	63	65	67	69
11 Existing Regs.	33	48	49	51	51	52	54	55	57	59	61	62	64	66	68
12 New Regs.	NA	NA	1	1	1	1	1	1	1	1	1	1	1	1	1
13 Operating Cost	114	110	107	108	107	82	59	40	24	12	(28)	(30)	(32)	(34)	(36)
14 Existing Regs.	114	110	107	106	106	81	59	40	24	12	(28)	(30)	(32)	(34)	(36)
15 Maint. Exp.	1	(3)	(7)	(10)	(13)	(16)	(19)	(21)	(24)	(26)	(28)	(30)	(32)	(34)	(36)
16 Fuel Price Penalty	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
17 Fuel Economy Penalty	113	113	114	116	119	97	78	61	48	38	0	0	0	0	0
18 New Regs.	NA	NA	NA	1	1	1	**	**	**	**	**	**	**	**	**

HDGE2 consists of gasoline powered trucks with a gross vehicle weight greater than 10,000 pounds.

Footnotes correspond to the footnotes for Table C-2A, with the following exceptions:

16. Data not available to compute a fuel price penalty for this vehicle class.

Refer to Table C-14A for supporting details.

Table C-7: CONTROL COSTS FOR HEAVY-DUTY DIESEL ENGINES (HDDE)

(millions of 1986 dollars)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Annualized Cost	0	0	0	0	0	0	0	7	12	17	21	26	32	40	48
2 Capital Expend.	0	0	0	0	0	0	0	49	36	35	29	34	43	52	58
3 Operating Cost	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 Maint. Exp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 Fuel Price Penalty	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6 Fuel Economy Penalty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Footnotes correspond to the footnotes for Table C-2, with the following exceptions:

5. Not applicable for diesel engines.

Table C-7A: CONTROL COSTS FOR HEAVY-DUTY DIESEL ENGINES (HDDE)

(millions of 1986 dollars)

Line Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7 Total Annualized Cost	48	56	67	72	78	332	589	557	525	488	487	487	483	483	483
8 Existing Regs.	48	56	65	68	72	76	82	87	91	94	97	100	102	105	108
9 New Regs.	NA	NA	2	4	6	256	508	470	434	394	390	387	381	378	374
10 Capital Expend.	58	61	77	79	79	127	131	135	163	168	173	179	184	189	195
11 Existing Regs.	58	61	63	65	65	67	69	71	73	75	77	80	82	84	87
12 New Regs.	NA	NA	14	14	14	60	62	64	90	93	96	99	102	105	108
13 Operating Cost	0	0	0	0	0	241	484	437	388	335	318	301	282	266	249
14 Existing Regs.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15 Maint. Exp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16 Fuel Price Penalty	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
17 Fuel Economy Penalty	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18 New Regs.	NA	NA	NA	NA	0	241	484	437	388	335	318	301	282	266	249

HDDE consists of diesel powered trucks with a gross vehicle weight greater than 10,000 pounds.

Footnotes correspond to the footnotes for Table C-2A, with the following exceptions:

16. Not applicable for diesel engines.

18. HDDE operating costs are affected by two new regulations (see Table C-15A).

Table C-8: CONTROL COSTS FOR MOTORCYCLES

(millions of 1986 dollars)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Annualized Cost	(5)	(7)	(10)	(12)	(14)	(18)	(17)	(21)	(12)	10	29	42	50	62	70
2 Capital Expend.	0	0	0	0	0	0	75	75	129	122	105	66	62	89	68
3 Operating Cost	(5)	(7)	(10)	(12)	(14)	(18)	(28)	(42)	(52)	(47)	(42)	(39)	(39)	(41)	(42)
4 Maint. Exp.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5 Fuel Price Penalty	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6 Fuel Economy Penalty	(5)	(7)	(10)	(12)	(14)	(18)	(28)	(42)	(52)	(47)	(42)	(39)	(39)	(41)	(42)

Footnotes correspond to the footnotes for Table C-2, with the following exceptions:

4,5. Not applicable for motorcycles.

Table C-8A: CONTROL COSTS FOR MOTORCYCLES

(millions of 1986 dollars)

Line	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7 Total Annualized Cost	70	75	69	63	45	39	29	26	23	17	14	14	14	14	15
8 Existing Regs.	70	75	69	63	45	39	29	26	23	17	14	14	14	14	15
9 New Regs.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10 Capital Expend.	68	46	47	49	51	53	55	56	59	61	63	65	67	70	72
11 Existing Regs.	68	46	47	49	51	53	55	56	59	61	63	65	67	70	72
12 New Regs.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13 Operating Cost	(42)	(44)	(46)	(48)	(55)	(51)	(53)	(56)	(58)	(60)	(63)	(65)	(68)	(70)	(73)
14 Existing Regs.	(42)	(44)	(46)	(48)	(55)	(51)	(53)	(56)	(58)	(60)	(63)	(65)	(68)	(70)	(73)
15 Maint. Exp.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
16 Fuel Price Penalty	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
17 Fuel Economy Penalty	(42)	(44)	(46)	(48)	(55)	(51)	(53)	(56)	(58)	(60)	(63)	(65)	(68)	(70)	(73)
18 New Regs.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Footnotes correspond to the footnotes for Table C-2A, with the following exceptions:

9,12,15,16,18. Not applicable for motorcycles.

Table C-9: CONTROL COSTS FOR AIRCRAFT

(millions of 1986 dollars)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Annualized Cost	0	0	0	1	3	6	8	9	10	11	14	22	21	19	17
2 Capital Expend.	0	0	0	6	13	21	15	6	7	9	35	62	9	8	10
3 Operating Cost	0	0	0	0	0	0	0	0	0	(0)	(2)	(3)	(5)	(7)	(9)
4 Maint. Exp.	0	0	0	0	0	0	0	0	0	0	1	2	2	3	4
5 Fuel Price Penalty	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6 Fuel Economy Penalty	0	0	0	0	0	0	0	0	0	(1)	(3)	(5)	(7)	(10)	(13)

Footnotes correspond to the footnotes for Table C-2, with the following exceptions:

5. Not applicable for aircraft.

Table C-9A: CONTROL COSTS FOR AIRCRAFT

(millions of 1986 dollars)

Line Year	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
7 Total Annualized Cost	17	14	11	10	9	7	2	(7)	(8)	(10)	(11)	(13)	(15)	(18)	(20)
8 Existing Regs.	17	14	11	10	9	7	2	(7)	(8)	(10)	(11)	(13)	(15)	(18)	(20)
9 New Regs.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
10 Capital Expend.	10	12	13	15	11	11	7	8	11	12	11	13	13	15	13
11 Existing Regs.	10	12	13	15	11	11	7	8	11	12	11	13	13	15	13
12 New Regs.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
13 Operating Cost	(9)	(11)	(13)	(16)	(17)	(19)	(20)	(21)	(23)	(25)	(27)	(29)	(31)	(34)	(36)
14 Existing Regs.	(9)	(11)	(13)	(16)	(17)	(19)	(20)	(21)	(23)	(25)	(27)	(29)	(31)	(34)	(36)
15 Maint. Exp.	4	5	6	8	8	9	10	10	11	12	13	14	15	16	17
16 Fuel Price Penalty	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
17 Fuel Economy Penalty	(13)	(16)	(20)	(23)	(26)	(28)	(30)	(32)	(34)	(37)	(40)	(43)	(46)	(50)	(53)
18 New Regs.	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Footnotes correspond to the footnotes for Table C-2A, with the following exceptions:

9,12,16,18. Not applicable for aircraft.

Table C-10: LIGHT-DUTY VEHICLE CONTROL COSTS -- SUPPORTING DETAIL

(all dollars are millions of 1986)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Capital Expend. per Veh.	19.1	38.6	38.6	283.0	283.0	283.0	283.0	283.0	331.1	408.3	410.7	440.1	474.6	474.6	474.6
2 Maint. Cost per Vehicle	4.7	4.7	4.7	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3
3 Fuel Econ. Penalty/Veh. Mile	0.003	0.004	0.000	0.000	-0.001	0.000	0.000	0.000	0.000	-0.002	-0.002	-0.002	-0.002	-0.002	-0.001
4 Inspection/Maint. Programs	0	0	0	11	11	42	42	42	42	54	135	162	513	571	834
5 Existing	0	0	0	11	11	42	42	42	42	54	135	162	513	571	834
6 New	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 Production(10E6)	11	11	9	9	10	11	11	11	9	9	8	9	10	11	11
8 Total Vehicles in Use(10E6)	30	41	50	58	66	75	83	88	91	93	93	93	95	97	99
9 Unl. Miles Driven/Flt(10E6)	0	0	0	90844	196874	308713	415492	507265	581026	642566	687872	735275	787928	838928	884782

Table C-10A: LIGHT-DUTY VEHICLE CONTROL COSTS -- SUPPORTING DETAIL

(all dollars are millions of 1986)

Line	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Capital Expend. per Veh.	475	475	475	475	475	475	475	475	475	475	475	475	475	475	475
2 Maint. Cost per Vehicle	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3	-13.3
3 Fuel Econ. Penalty/Veh. Mile	-0.0	-0.0	-0.0	-0.0	-0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4 Inspection/Maint. Programs	834	877	877	877	877	877	877	877	877	877	877	877	877	877	877
5 Existing	834	877	877	877	877	877	877	877	877	877	877	877	877	877	877
6 New	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 Production(10E6)	11	11	11	10	10	11	11	11	11	12	12	12	12	12	12
8 Total Vehicles in Use(10E6)	99	100	101	102	103	104	105	106	107	108	109	110	112	113	114
9 Unl. Miles Driven/Flt(10E6)	884782	915164	943105	958231	972766	989285	1004818	1020747	1036167	1051124	1065277	1080328	1095048	1109349	1123098

Footnotes to Tables C-10 and C-10A by Line

1. Sum of the costs for vehicle pollution control devices such as: catalysts (Ref. 4), air pumps (Ref. 6), exhaust-gas recirculation units (Ref. 10), high altitude controls (Ref. 4), and evaporative emissions canisters (Ref. 4). These control devices were phased in at various points in time. The timing was due to 1) new regulatory requirements and/or 2) technological advancements in control devices.

2. We assumed a pre-1975 baseline maintenance expense of \$5.00 per vehicle per year to cover maintenance expenses prior to the existence of inspection/maintenance programs and also to cover those vehicle maintenance expenditures for vehicles which are not in areas with established inspection/maintenance programs. Beginning in 1975, the maintenance benefits from the use of catalytic converters (Ref. 4)was added to the baseline cost.

3. Calculated as the difference in fuel efficiency (in terms of miles per gallon) between a vehicle equipped with emissions controls and one that is not (Ref. 5), multiplied by the price of gasoline (Ref. 5,9, Table 9.4).

4. Sum of lines 5 and 6. Millions of 1986 dollars.

5. These costs are due to inspection/maintenance programs implemented prior to 1988. The cost includes a component for the inspection program fee plus a weighted average cost of repair for those vehicles requiring repair. This was computed by dividing population (Ref. 14) for areas with programs by the population per vehicle (Ref. 2). This equals the number of vehicles affected by the programs, which was then multiplied by a per vehicle cost (Ref.15) to derive total cost. Millions of 1986 dollars.

6. Same process as footnote 5 with an incremental cost per vehicle (Ref.15) to account for program enhancement expected after 1988. Millions of 1986 dollars.

7. Ref. 5,7 App. B (pp.B5-B18).

8. Calculated as vehicle production (line 7) times the vehicle survival rate per age class (Ref.2, p.26) corresponding to that year and age. Each year accumulates figures from up to the previous twenty years.

9. Calculated as production (line 12) times the percentage of each model year using unleaded gasoline (Ref.5) times the vehicle survival rate (Ref.2, p.26). Each year's figure includes a running total for previous years' surviving vehicles.

Table C-11: LDT1 CONTROL COSTS -- SUPPORTING DETAIL

(all dollars are millions of 1986)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Capital Expend. per Veh.	20	44	44	268	268	268	268	284	284	332	332	354	480	480	480
2 Maint. Cost per Vehicle	5	5	5	-5	-5	-5	-5	-6	-6	-8	-8	-8	-8	-8	-8
3 Fuel Econ. Penalty/Veh. Mile	0.003	0.004	0.000	0.002	-0.001	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4 Inspection/Maint. Programs	0	0	0	2	2	6	6	6	6	8	20	24	76	84	123
5 Existing	0	0	0	2	2	6	6	6	6	8	20	24	76	84	123
6 New	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 Production(10E6)	1.5	1.8	1.5	1.1	1.3	1.3	1.3	1.2	0.9	0.8	0.9	1.0	1.3	1.4	1.5
8 Total Vehicles in Use(10E6)	3.6	5.2	6.5	7.3	8.2	9.1	9.9	10.6	10.9	11.1	11.4	11.7	12.3	12.9	13.5
9 Unleaded Miles Driven/Fleet	0	0	0	15512	34794	52862	68868	81398	87016	90109	93837	98339	105286	112771	120059

All footnotes correspond to the footnotes for Table C-10.

Table C-11A: LDT1 CONTROL COSTS -- SUPPORTING DETAIL

(all dollars are millions of 1986)

Line	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Capital Expend. per Veh.	480	480	480	480	480	480	480	480	480	480	480	480	480	480	480
2 Maint. Cost per Vehicle	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8	-8
3 Fuel Econ. Penalty/Veh. Mile	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4 Inspection/Maint. Programs	123	129	129	129	129	129	129	129	129	129	129	129	129	129	129
5 Existing	123	129	129	129	129	129	129	129	129	129	129	129	129	129	129
6 New	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 Production(10E6)	1.5	1.6	1.6	1.6	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.0	2.1	2.2	2.2
8 Total Vehicles in Use/Yr(10E	13.5	14.2	14.9	15.5	15.8	16.2	16.6	17.0	17.4	18.0	18.5	19.1	19.8	20.4	21.2
9 Unleaded Miles Driven/Fleet	120059	126874	132594	136730	139705	0	0	0	0	0	0	0	0	0	0
Other: Future Regulations:															
10 NOx (per Veh.)	NA	NA	31.74	31.74	31.74	31.74	31.74	31.74	31.74	31.74	31.74	31.74	31.74	31.74	31.74

All footnotes correspond to the footnotes for Table C-10, wth the following exceptions:

10. Reference 12. See footnotes Table C-15A.

Table C-12: LDT2 CONTROL COSTS -- SUPPORTING DETAIL

(all dollars are millions of 1986)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Capital Expend. per Veh.	14	25	25	14	14	14	14	330	330	330	330	332	450	450	450
2 Maint. Cost per Vehicle	5	5	5	5	5	5	5	-12	-12	-12	-12	-12	-12	-12	-12
3 Fuel Econ. Penalty/Veh. Mile	0.006	0.009	0.001	0.001	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4 Inspection/Maint. Programs	0	0	0	2	2	6	6	6	6	6	17	18	50	58	89
5 Existing	0	0	0	2	2	6	6	6	6	6	17	18	50	58	89
6 New	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 Production(10E6)	1.0	1.2	1.1	0.9	1.3	1.6	1.9	1.4	0.9	0.8	0.9	0.9	1.1	1.2	1.3
8 Total Vehicles in Use(10E6)	2.3	3.4	4.3	5.1	6.1	7.3	8.8	9.8	10.2	10.3	10.6	10.9	11.4	11.9	12.5
9 Unleaded Miles Driven/Fleet	0	0	0	0	0	0	0	25544	38516	47285	56587	65346	75444	85519	94943

All footnotes correspond to the footnotes for Table C-10.

Table C-12A: LDT2 CONTROL COSTS -- SUPPORTING DETAIL

(all dollars are millions of 1986)

Line	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Capital Expend. per Veh.	450	450	450	450	450	450	450	450	450	450	450	450	450	450	450
2 Maint. Cost per Vehicle	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12	-12
3 Fuel Econ. Penalty/Veh. Mile	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4 Inspection/Maint. Programs	89	93	93	93	93	93	93	93	93	93	93	93	93	93	93
5 Existing	89	93	93	93	93	93	93	93	93	93	93	93	93	93	93
6 New	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7 Production(10E6)	1.3	1.4	1.4	1.4	1.4	1.5	1.5	1.6	1.6	1.7	1.8	1.8	1.9	1.9	2.0
8 Total Vehicles in Use/Yr(10E	12.5	13.1	13.6	14.1	14.5	14.9	15.2	15.6	16.0	16.4	16.9	17.2	17.6	18.2	18.8
9 Unleaded Miles Driven/Fleet	94943	102942	109553	114856	118570	0	0	0	0	0	0	0	0	0	0
Other: Future Regulations:															
10 NOx (per Veh.)	NA	NA	21.06	21.06	21.06	21.06	21.06	21.06	21.06	21.06	21.06	21.06	21.06	21.06	21.06

All footnotes correspond to the footnotes for Table C-10, with the following exceptions:

10. Reference 12. See footnotes Table C-15A.

Table C-13: HDGE1 CONTROL COSTS -- SUPPORTING DETAIL

(all dollars are millions of 1986)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Capital Expend. per Veh.	46	46	103	103	103	103	103	186	186	186	186	186	186	360	360
2 Maint. Cost per Vehicle	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3 Fuel Econ. Penalty/Veh. Mile	0.000	0.000	0.002	0.002	0.003	0.003	0.004	0.006	0.007	0.006	0.006	0.006	0.006	0.006	0.005
4 Inspection/Maint. Programs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5 Existing	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6 New	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7 Production(10E6)	0.10	0.13	0.11	0.10	0.13	0.15	0.17	0.14	0.09	0.08	0.06	0.07	0.09	0.10	0.11
8 Total Vehicles in Use(10E6)	0.24	0.35	0.43	0.49	0.58	0.68	0.79	0.86	0.86	0.85	0.82	0.80	0.81	0.82	0.83
9 Unleaded Miles Driven/Fleet	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

All footnotes correspond to the footnotes for Table C-10.

Table C-13A: HDGE1 CONTROL COSTS -- SUPPORTING DETAIL

(all dollars are millions of 1986)

Line	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Capital Expend. per Veh.	360	534	534	534	534	534	534	534	534	534	534	534	534	534	534
2 Maint. Cost per Vehicle	5	-38	-38	-38	-38	-38	-38	-38	-38	-38	-38	-38	-38	-38	-38
3 Fuel Econ. Penalty/Veh. Mile	0.005	0.005	0.005	0.005	0.005	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4 Inspection/Maint. Programs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5 Existing	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6 New	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7 Production(10E6)	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.13	0.14	0.14	0.14	0.15	0.15	0.16	0.16
8 Total Vehicles in Use/Yr(10E	0.83	0.86	0.88	0.90	0.91	0.93	0.95	0.97	0.99	1.02	1.04	1.07	1.10	1.13	1.17
9 Unleaded Miles Driven/Fleet	0	2276	4294	6067	7513	0	0	0	0	0	0	0	0	0	0
Other: Future Regulations:															
10 NOx (per Veh.)	NA	NA	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20

All footnotes correspond to the footnotes for Table C-10, with the following exceptions:

10. Reference 12. See footnotes Table C-15A.

Table C-14: HDGE2 CONTROL COSTS -- SUPPORTING DETAIL

(all dollars are millions of 1986)

Line	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
1 Capital Expend. per Veh.	46	46	103	103	103	103	103	186	186	186	186	186	186	360	360
2 Maint. Cost per Vehicle	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3 Fuel Econ. Penalty/Veh. Mile	0.000	0.000	0.004	0.004	0.007	0.007	0.007	0.010	0.014	0.015	0.015	0.014	0.014	0.014	0.011
4 Inspection/Maint. Programs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5 Existing	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6 New	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7 Production(10E6)	0.31	0.31	0.29	0.23	0.20	0.20	0.23	0.17	0.11	0.06	0.05	0.06	0.08	0.08	0.09
8 Total Vehicles in Use(10E6)	0.76	1.01	1.22	1.34	1.41	1.47	1.55	1.56	1.51	1.41	1.31	1.22	1.15	1.09	1.05
9 Unleaded Miles Driven/Fleet	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

All footnotes correspond to the footnotes for Table C-10.

Table C-14A: HDGE2 CONTROL COSTS -- SUPPORTING DETAIL

(all dollars are millions of 1986)

Line	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1 Capital Expend. per Veh.	360	498	498	498	498	498	498	498	498	498	498	498	498	498	498
2 Maint. Cost per Vehicle	5	-38	-38	-38	-38	-38	-38	-38	-38	-38	-38	-38	-38	-38	-38
3 Fuel Econ. Penalty/Veh. Mile	0.011	0.011	0.011	0.011	0.012	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
4 Inspection/Maint. Programs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5 Existing	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6 New	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
7 Production(10E6)	0.09	0.10	0.10	0.10	0.10	0.11	0.11	0.11	0.12	0.12	0.12	0.13	0.13	0.13	0.14
8 Total Vehicles in Use(10E6)	1.05	1.01	0.98	0.95	0.92	0.90	0.88	0.87	0.87	0.88	0.89	0.91	0.93	0.96	0.99
9 Unleaded Miles Driven/Fleet	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Other: Future Regulations:															
10 NOx (per Veh.)	NA	NA	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20	7.20

All footnotes correspond to the footnotes for Table C-10, with the following exceptions:

10. Reference 12. See footnotes Table C-15A.

Table C-15: CAPITAL CONTROL COSTS DUE TO NEW REGULATIONS

(millions of 1986 dollars)

Reg. Veh. Class	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
NOx + PM Standard													
LDT1	51	51	52	53	55	57	59	61	63	65	67	69	71
LDT2	29	30	30	32	33	34	35	36	37	38	39	41	42
HDGE1	1	1	1	1	1	1	1	1	1	1	1	1	1
HDGE2	1	1	1	1	1	1	1	1	1	1	1	1	1
HDDE	14	14	14	60	62	64	90	93	96	99	102	105	108
Total	96	97	97	147	151	156	186	191	197	203	210	216	223

All per vehicle costs were obtained from the appropriate RIA (Ref. 12) and multiplied by production estimates (Tables C-10A—C-14A).

Table C-15A: OPERATING CONTROL COSTS DUE TO NEW REGULATIONS

(millions of 1986 dollars)

Reg. Veh. Class	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Fuel Volatility		134	134	134									
Diesel Fuel Quality													
HDDE					225	173	117	56	31	6	-22	-49	-76
NOx + PM Standard													
HDDE				241	259	265	272	279	287	295	305	314	325
Total: All Regs.		134	134	375	484	439	389	335	318	301	283	265	249

Fuel Volatility: Notice of Final Rulemaking (Ref. 17)

Diesel Fuel Quality: Draft Regulatory Impact Analysis (Ref. 16)

NOx + PM Standard: Regulatory Impact Analysis (Ref.12).

Table C-16: CAPITAL CONTROL COSTS BY POLLUTANT

(millions of 1986 dollars)

Pollutant	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
NOx	91	92	92	106	110	113	117	120	124	128	132	136	141
PM	5	5	5	40	41	43	69	71	73	75	77	80	82
Total	96	97	97	147	151	156	186	191	197	203	210	216	223

Costs attributable to controlling NOx and PM are associated with one regulation, the NOx and PM truck standard. See Table C-15.

Table C-16A: OPERATING CONTROL COSTS BY POLLUTANT

(millions of 1986 dollars)

Pollutant	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
HC		134	134	134									
PM	0	0	0	241	484	438	389	335	318	301	283	265	249
Total	0	134	134	375	484	438	389	335	318	301	283	265	249

All costs are taken directly from Table C-15A.

Below is a list of new regulations and the pollutants they are primarily designed to control:

Fuel Volatility -- hydrocarbons

Diesel Sulfur Content -- particulate matter

NOx + PM Truck Standards -- oxides of nitrogen and particulate matter

Table C-17: CONTROL COSTS DUE TO CAA AMENDMENTS

(millions of 1986 dollars)

Line	1993	1994	1995	1996	1997	1998	1999	2000
1 Reid Vapor Pressure II	222	228	232	236	240	243	247	251
2 Evaporative/Running Losses	57	58	58	59	59	60	60	61
3 Tailpipe/Useful Life	436	440	444	448	452	456	460	464
4 Refueling: Stage II	108	112	116	120	124	127	131	135
5 Alternative Fuels			145	145	145	145	145	0
6 Basic Inspect./Maintenance	65	66	67	68	69	70	71	72
7 Enhanced Inspect./Maint.	69	70	71	72	73	75	76	77
8 Oxides of Nitrogen (NOx)	369	371	372	374	375	377	378	380
9 Air Toxics			700	1400	2100	2800	2800	2800
10 Total	1326	1345	2205	2922	3637	4353	4368	4240

Footnotes to Table C-17 by Line

Except for line 9 (Ref. 20), all costs were derived from the 1995 and 2005 point estimates given in Reference 18. Interpolation was used to fill in intervening years. For simplicity, all costs were assumed to begin in 1993 and are treated as operating costs. These costs are *not* divided between the various vehicle classes and, therefore, they are only reflected in Table C-1A (Total Costs for All Vehicle Classes).

Following is a brief discussion of each of the nine line items. This discussion is only intended to highlight some of the more significant provisions related to each line entry. Reference 19 (Title II of H.R.3030) applies to each line entry (except where noted otherwise) and should be consulted for more detail.

1. Reid Vapor Pressure II - requires the Reid vapor pressure of gasoline not to exceed 9.0 pounds per square inch (Sec. 214).

2. Evaporative/Running losses - requires the greatest degree of emission reduction achievable with respect to evaporative emissions of hydrocarbons from all gasoline-fueled motor vehicles (1) during operation and (2) over two or more days of nonuse, during ozone prone summertime conditions (Sec. 205).

3. Tailpipe/Useful Life - consists of a number of regulatory provisions. Tightened tailpipe standards is a general term consisting of an array of more stringent standards for emissions of hydrocarbons, carbon monoxide, and oxides of nitrogen for light-duty vehicles and light-duty trucks. For light-duty vehicles, emissions of hydrocarbons must be reduced incrementally so that by the 1995 model year emissions are not exceeding 0.25 grams per vehicle mile (gpm). Emissions of carbon monoxide from 1981 and later model years may not exceed 3.4 gpm. And emissions of oxides of nitrogen will be gradually reduced from 1.0 gpm to 0.7 gpm by the 1995 model year (Sec. 202). Light-duty trucks must meet hydrocarbon emissions limits of 0.41 gpm and 0.50 gpm (depending on the loaded vehicle weight) by the 1996 model year. Similarly, carbon monoxide standards of 4.20 gpm and 5.50 gpm (also depending on vehicle weight) must be met by the 1996 model year (Sec. 203). Useful life refers to the initiative to require the manufacturer's of pollution control equipment to increase the useful life of such euipment from 50,000 to 100,000 miles.

4. Refueling: Stage II - requires the owners or operators of all gasoline dispensing systems in nonattainment areas designated as "moderate" to install a system for gasoline vapor recovery during the fueling of motor vehicles (Title I, Sec. 103). Usually a vapor trapping nozzle is attached to a fuel dispensor which returns the recovered vapors to the fueling stations gasoline storage tanks.

5. Alternative Fuels - is the general term for the program that includes the manufacturing of "clean-fuel" vehicles and the supplying of clean fuel for those vehicles. The costs figures in line 5 combine the costs for the fuel program and the vehicle program. While the term "clean alternative fuels" refers to any power source with low emissions comparable to gasoline, the costs shown here assume that methanol is the fuel of choice. Currently, the scope of the program is to include those nonattainment areas with a 1988 ozone design value at or above 0.18 parts per million and having a 1980 population of two hundred and fifty thousand or more. Additionally, the program calls for the production of clean fuel vehicles according to the following schedule: 500,000 in 1995, 750,000 in 1996 and 1,000,000 each year for the period between 1997 and 2003 (Sec. 201).
6. Basic Inspection/Maintenance - provides for the establishment of inspection/maintenance programs in marginal nonattainment areas (Title I, Sec. 103).

7. Enhanced Inspection/Maintenance - provides for a revision (i.e., enhancement) in the current inspection/maintenance program for serious nonattainment areas (Title I, Sec. 103).

8. Oxides of Nitrogen - the standards for this entry are explained under the tightened tailpipe entry (line 3). The costs are shown as a separate entry because they comprise a significantly large percentage of the total costs.

9. Air Toxics - requires a study to be completed evaluating air toxics emitted from mobile sources and their fuels and any necessary regulations to be implemented. It also requires the regulation of at least benzene and formaldehyde (Ref. 20). The numbers shown are the estimated costs of controlling benzene and formaldehyde. These costs were derived using the following assumptions and calculations. Reference 20 gives an estimated cost of control for the year 2003. Since 1998 is the first model year impacted by any air toxics regulation, it was assumed that 100 percent of the costs would be incurred in 1998 and beyond. Prior to 1998, costs were assumed to be incurred according to the following schedule (to account for lead-time, tooling-up, etc...,): 1995 - 25 percent, 1996 - 50 percent, 1997 - 75 percent.

It should be noted that the provisions listed above are not the only possible regulatory options under consideration for the administration's proposal. They represent the provisions under consideration *with available cost information* at the time of the writing of this appendix. The costs of the final ammendments are expected to be higher.

APPENDIX D
ESTIMATION OF PRIVATE RADON MITIGATION COSTS

This appendix provides documentation for the estimated costs of private radon mitigation efforts which are presented in Chapter 3. The costs, which are shown in Table D-1, are based on survey data on actual current expenditures and extrapolation from these estimates. The cost estimates represent what can reasonably be expected given observed responses to current programs.

The estimates provided in Table D-1 were generated by adapting a radon mitigation model developed by Small and Peters (1988).[1] They include costs for both roughing-in and activating new construction and for retrofitting existing homes. The lognormal exposure distribution parameters used for our analysis were obtained from Puskin and Nelson (1989).[2]

Small and Peters assume a fixed testing rate and a logistic mitigation gradient. Doyle, et al. (1990)[3] report that 2.6 percent of the households in the Washington, D.C. media market tested for radon exposure as part of a WJLA television radon awareness campaign. Desvousges, et al. (1989)[4] found that 4-5 percent of the households in Randallstown, Maryland had tested for radon exposure over a three-year period in the absence of any special outreach program. The EPA Radon Program reported that 1.5 million radon monitors had been sold by mid-1989. A two percent testing rate appears consistent with these data and was thus used to generate testing cost estimates. An average cost of $20 per test for monitoring was assumed for both new and existing homes.

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[1] Small, Mitchell J. and Catherine A. Peters, "Public Policy Model for the Indoor Radon Problem," *Mathematical Computer Modeling* 10:5 (1988), 349-358.

[2] Puskin, Jerome S. and Christopher B. Nelson, "EPA's Perspective on Risks from Residential Radon Exposure," *Journal of the Air Pollution Control Association*, 39:7 (July 1989), 915-920.

[3] Doyle, James K., Gary H. McClelland, William D. Schulze, Paul A. Locke, Steven R. Elliott, Glenn W. Russell, and Andrew Moyad, *An Evaluation of Strategies for Promoting Effective Radon Mitigation*, U.S. Environmental Protection Agency report EPA/230/02-90-275, March, 1990.

[4] Desvousges, William H., V. Kerry Smith, and Hillery H. Rink III, *Communicating Radon Risk Effectively: Radon Testing in Maryland*, Research Triangle Institute final report to U.S. EPA Office of Planning and Evaluation, EPA-230-03-89-048, March 1989.

An average of about 1.1 million new single-family homes have been built over the last fifteen years.[5] About one percent of new homes are currently being constructed with roughed-in passive radon mitigation at a cost of $300 per home. It costs an additional $200 to activate the system. To calculate these costs for future years, it is assumed that the rough-in rate will double in 1990 and increase by two percent per year through the year 2000. In the absence of data on the behavior of owners of homes with roughed-in systems, they are assumed to be twice as likely to test and mitigate as owners of homes that are not roughed-in.

Figure D-1 shows the assumed logistic function for the probability of mitigating at various exposure levels. The points indicated in the figure show the proportion of respondents in an ongoing study of New York homeowners[6] who said they did something to lower their radon exposure and those who spent at least $100 on mitigation. These households participated in an extensive monitoring and risk communication study over a three-year period. Table D-2 shows the number of homeowners who mitigated at various exposure and cost levels. The New Jersey Department of Environmental Protection indicates that about 12,000 New Jersey homes had been mitigated as of 1989. The EPA Radon Program estimates the national mitigation level to be about four times this number. The rate derived from the logistic response gradient is consistent with this EPA's estimate.

The overall average mitigation cost in the New York study was about $1200. In a personal communication, William Schulze reported that eight of the 700 respondents in the WJLA survey employed a private mitigation contractor and reduced home radon exposures to 3-5 pCi/l. The average cost was $1346, but one homeowner paid $4500. Excluding the high observation, the average cost was $895. Respondents estimated that operating costs averaged $73 per year. An additional 43 homeowners reported average mitigation costs of $123, but did not retest; the effectiveness of these efforts is thus questionable.

Napolitano (1987)[7] estimated average costs weighted by home foundation type to be about $1800 in capital costs and $130 in annual operating and maintenance cost. Bruce Henschel of the EPA Office of Research and Development estimates that 95 percent of homes with basement readings between 4 and 10 pCi/l could be mitigated at a commercial cost of $800-$2500. The cost estimates reported here are based on the $1200 cost from the New York study as the best available estimate of what homeowners actually spent in 1988 on capital costs, and Napolitano's estimate of O&M costs.

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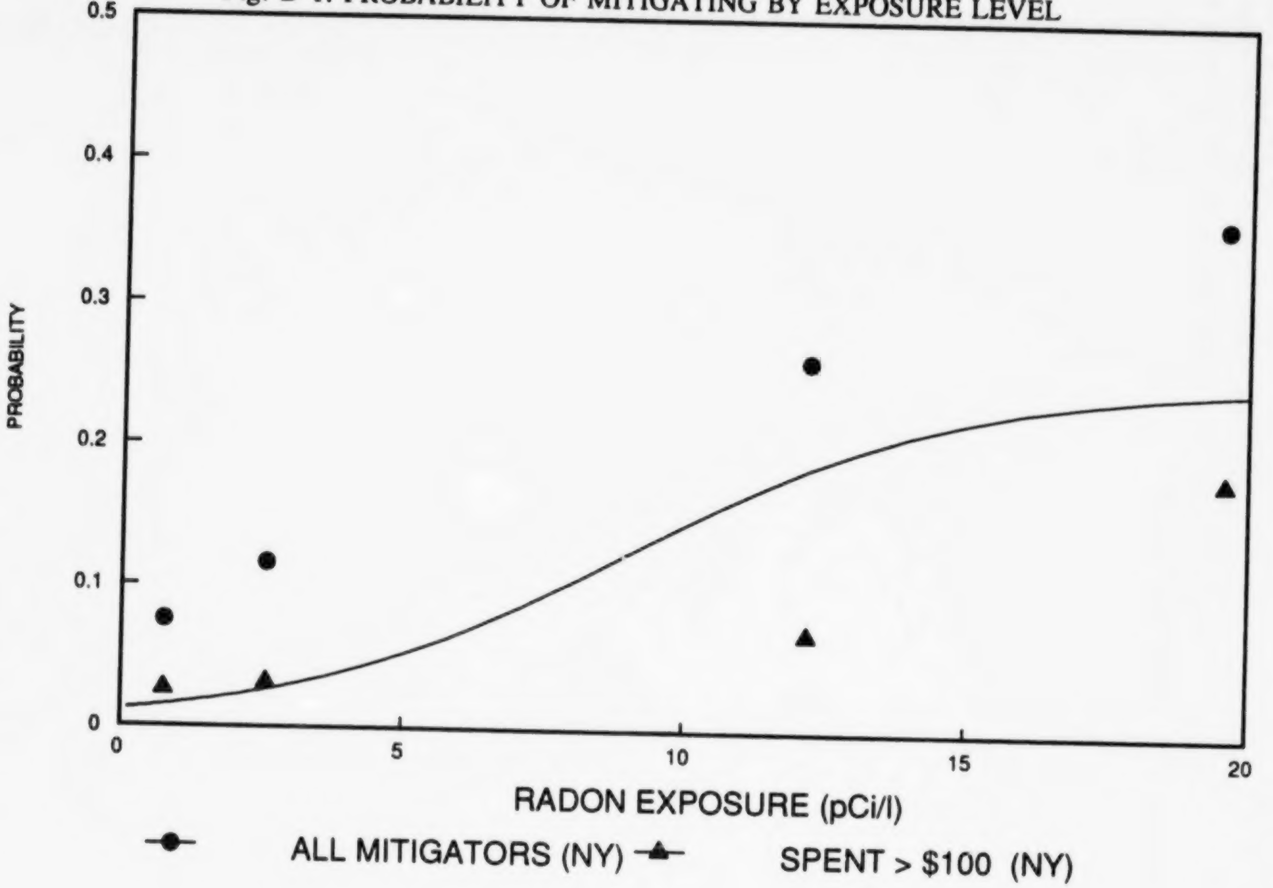
[5] U.S. Bureau of the Census, *Statistical Abstract of the United States*, 109th ed., Washington, D.C., 1989.

[6] Smith, V. Kerry, William H. Desvousges, Ann Fisher, and F. Reed Johnson, *Communicating Radon Risk Effectively: A Mid-Course Evaluation*, final report to U.S. EPA Office of Policy, Planning, and Evaluation, EPA-230-07-87-029, July 1987.

[7] Napolitano, Samuel, "An Analysis of Radon Risks and Strategies for their Reduction," EPA Office of Radiation Programs, October 2, 1987 draft.

There was very little homeowner radon testing and mitigation activity in 1986 and 1987. The cost estimates assume a rapid buildup to current levels of activity from nearly negligible levels in the first two years. The cost analysis in this report assumes that the public's response to EPA's outreach activities will remain the same through the year 2000. In each year after 1988, we assume that two percent of the untested population will monitor their homes for radon. Mitigation rates for existing homes with radon exposure above four pCi/l are assumed to continue to range between five percent and 25 percent.

Fig. D-1: PROBABILITY OF MITIGATING BY EXPOSURE LEVEL



Source: Based on proportion of respondents in V. Kerry Smith, William H. Desvousges, Ann Fisher, and F. Reed Johnson, *Communicating Radon Risk Effectively: A Mid-Course Evaluation*, final report to U.S. EPA Office of Policy, Planning, and Evaluation, EPA-230-07-87-029, July 1987, who said they did something to lower their radon exposure and those who spent at least $100 on mitigation.

Table D-1: PRIVATE RADON MITIGATION COSTS

(millions of 1986 dollars)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Monitoring Costs															
1. New Construction	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
2. Existing Homes	0.5	1.5	10.0	23.6	22.9	22.4	22.0	21.5	21.1	20.7	20.3	19.9	19.5	19.1	18.7
3. Total Monitoring Costs	0.5	1.5	10.0	23.6	22.9	22.5	22.0	21.6	21.2	20.8	20.4	20.0	19.6	19.3	18.9
Capital Costs															
4. New Construction	0.0	0.7	1.7	3.5	6.9	13.9	20.8	27.7	34.6	41.6	48.5	55.4	62.4	69.3	76.2
5. Existing Homes	0.6	1.8	22.1	52.2	49.6	47.6	45.7	43.8	42.0	40.2	38.5	36.8	35.3	33.7	32.2
6. Total Capital Costs	0.6	2.5	23.8	55.7	56.5	61.5	66.5	71.5	76.6	81.8	87.0	92.3	97.6	103.0	108.4
7. Total Capital Costs	1.1	4.0	33.8	79.3	79.4	94.0	88.5	93.1	97.8	102.6	107.4	112.3	117.2	122.3	127.3
Operating Costs															
8. New Construction	0.0	0.0	0.0	0.1	0.3	0.8	1.4	2.3	3.3	4.6	6.1	7.8	9.8	11.9	14.3
9. Existing Homes	0.1	0.3	2.7	8.3	13.7	18.8	23.8	28.5	33.1	37.4	41.6	45.6	49.4	53.1	56.6
10. Total Operating Costs	0.1	0.3	2.7	8.4	14.0	19.6	25.2	30.8	36.4	42.1	47.7	53.4	59.2	65.0	70.8
11. Total Costs	1.2	4.2	36.5	87.7	93.4	103.6	113.7	123.9	134.3	144.6	155.2	165.7	176.5	187.3	198.1
New Construction															
12. % Roughed in	0.0	0.2	0.5	1.0	2.0	4.0	6.0	8.0	10.0	12.0	14.0	16.0	18.0	20.0	22.0
13. % Activated	0.0	2.0	4.0	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
14. No. Activated	0	50	220	800	1,600	3,300	4,900	6,600	8,200	9,900	11,500	13,200	14,800	16,500	18,100
Existing Homes															
15. % Tested	0.0	0.1	0.8	2.0	1.9	1.9	1.9	1.8	1.8	1.8	1.7	1.7	1.7	1.6	1.6
16. % Mitigated	2.0	2.0	3.7	3.7	3.6	3.5	3.5	3.4	3.3	3.2	3.2	3.1	3.0	3.0	2.9
17. No. Mitigated	500	1,500	18,400	43,500	41,300	39,700	38,100	36,500	35,000	33,500	32,100	30,700	29,400	28,100	26,800

Notes for Table D-1 by Line:

1-3. Based on average monitoring costs of $20. Assumed test rates are shown in line 15.

4-6. Based on average rough-in costs of $300 and activation costs of $200 for new construction. Average mitigation cost for existing homes is $1,200. The number of mitigations is based on a 0.03 probability of testing. The probability of mitigating is given by 0.25/[1 + exp(3 - 0.33*concentration)]. Radon concentrations are assumed to be lognormally distributed with geometric mean of 0.9 and geometric standard deviation of 3.2. (See text of Appendix

D for further details.) Rates of testing and mitigation in roughed-in new construction are assumed to be twice those of existing homes. The rough-in and activation rates are shown in lines 12-14. The derived mitigation rates and associated number of mitigating households for each year are shown in lines 16 and 17.

7. Total of lines 3 and 6. Line 3 includes only initial monitoring, which is considered to be more a capital than an operating cost. Follow-up monitoring is included under line 10.

8-10. Based on average annual operating and maintenance cost of $130.

11. Total of lines 7 and 10.

Table D-2: MITIGATION BY EXPOSURE AND COST LEVELS

Annual Basement Reading (pCi/l)	Cost ($ per household)						Number of House-holds	Total Cost ($)	Average Cost ($)
	<100	101-500	501-1000	1001-2000	2501-5000	>5000			
<1	32	10	3	4	0	0	49	10,755	219
1-3.9	65	16	2	3	2	1	89	86,005	966
4-19.9	45	4	4	2	2	4	61	112,930	1,851
>20	6	3	2	0	1	0	12	35,920	2,993
Total Number	148	33	11	9	5	5	211	245,610	1,164

Source: Smith, V. Kerry, William Desvousges, Ann Fisher, and F. Reed Johnson, *Communicating Radon Risk Effectively: A Mid-Course Evaluation*, Final Report to the U.S. EPA Office of Policy, Planning and Evaluation, EPA-230-07-87-289, July 1987.

APPENDIX E
ESTIMATION OF NON-POINT SOURCE POLLUTION CONTROL COSTS

This appendix contains background data and documentation for the non-point source control costs presented in Chapter 4. Historical costs were derived for three types of non-point source pollution control which are discussed in the sections indicated below.

E.1. Soil erosion control;
E.2. Highway erosion control; and
E.3. Agricultural feedlot runoff control.

E.1. SOIL EROSION CONTROL

Table E-1 contains estimates of soil erosion control costs for public and private sectors of the economy. The capital costs are based on estimates of erosion control program grants distributed by Federal agencies, primarily the Department of Agriculture (USDA), with matching funds provided by state, local or private farming operations. Not all erosion control efforts are aimed at preventing water quality damages; thus, only a portion of total expenditures for erosion control were attributed to non-point source water pollution control. The portion chosen was 10 percent, which is based on information provided in USDA publications that breakdown certain Federal expenditures for erosion control program by purpose. The 10 percent factor was applied to costs for all erosion control activities, both public and private.

For certain years, the relative contribution of Federal, state, local and private costs are not broken out separately from the expenditure data. For these years, the average proportion of total costs borne by each sector in years for which data were available were used to estimate costs by sector.

While data on total costs and total capital costs are available, data on capital and operation and maintenance (O&M) costs for individual sectors is not reported. Additional information allowed us to distinguish private capital costs from government expenditures. Armed with this information, it was assumed that costs were divided evenly between capital and O&M expenditures for Federal, state and local governments, while 75 percent of private expenditures were for capital improvements and 25 percent were used to operate and maintain these structures. These ratios maintained the observed balance between aggregate national capital and O&M costs, and public and private costs.

E.2. HIGHWAY EROSION CONTROL

The cost estimates for highway erosion control shown in Table E-1 were provided by the Department of Commerce "Pollution Abatement and Control Expenditures" (PACE) reports. The Commerce reports do not separate state and local expenditures in this area. Therefore, it was assumed that the division is approximately 50-50, which mirrors that for soil erosion costs. The distribution of total costs between capital and O&M costs, on the other hand, was assumed to be more heavily weighted to O&M costs. Ninety percent of Federal costs were attributed to

O&M costs, and the remaining 10 percent to capital costs. The ratio of O&M to capital costs for state and local governments was assumed to be 4:1, due to the relatively greater amounts of new highway construction undertaken by state and local governments.

All highway erosion control measures are assumed to contribute to the improvement or maintenance of water quality conditions. If this assumption is too strong, the cost estimates should be adjusted downward to reflect only projects having positive contribution to water quality conditions in nearby waterbodies.

E.3. AGRICULTURAL FEEDLOT RUNOFF CONTROL

The cost estimates for agricultural feedlots shown in Table E-1 are included in the non-point source category, although a strong case can be made to include them in the point source category. The estimates are based on data from the Department of Commerce PACE reports. The costs are clearly differentiated in the PACE reports between capital and O&M expenditures. All costs are attributed to private operations, and no feedlot costs have been estimated for public activities, which are not significant.

E.4. MISSING ESTIMATES

The costs of non-agricultural erosion controls have not been included in the current cost estimates; thus, the costs of controlling water pollution from silvicultural, rangeland, and mining have been omitted. These costs have been significant in selected areas of the United States, but national estimates have been relatively low compared to costs for controlling agricultural sources of pollution. The costs of controlling nutrients on agricultural lands have not been included, although it is expected that some part of these costs have been captured in the costs included for erosion control. Some agricultural soil erosion control projects also serve to reduce nutrient runoff into rivers, lakes and estuaries.

Greater attention is currently being directed to non-point sources of pollution, so future costs may eventually prove to much greater than those estimated in this report. Preliminary analysis suggests that soil erosion costs would increase dramatically if pollution control measures were applied widely on farmlands.

Table E-1: CONTROL COSTS FOR CONSERVATION, HIGHWAY EROSION, AND ANIMAL FEEDLOTS

(millions of 1986 dollars)

Category/Funding Source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Soil Conservation															
Non-EPA Federal Capital	74	80	57	65	72	80	77	60	63	66	68	70	66	71	53
Non-EPA Federal Operating	74	80	57	65	72	80	77	60	63	66	68	70	66	71	53
State Government Capital	7	7	6	6	7	7	7	6	6	6	6	6	6	6	5
State Government Operating	7	7	6	6	7	7	7	6	6	6	6	6	6	6	5
Local Government Capital	7	7	6	6	7	7	7	6	6	6	6	6	6	6	5
Local Government Operating	7	7	6	6	7	7	7	6	6	6	6	6	6	6	5
Private Capital	70	74	59	65	70	76	72	60	64	64	66	68	63	68	51
Private Operating	23	25	20	22	23	25	24	20	21	21	22	23	21	23	17
Highway Erosion															
Non-EPA Federal Capital	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Non-EPA Federal Operating	7	6	5	5	6	6	5	6	5	7	6	7	7	5	5
State Government Capital	53	48	43	46	44	36	32	36	37	35	40	37	41	39	42
State Government Operating	213	193	170	184	177	146	127	143	146	142	159	150	165	156	168
Local Government Capital	53	53	53	53	53	53	53	53	53	53	53	53	53	53	53
Local Government Operating	213	213	213	213	213	213	213	213	213	213	213	213	213	213	213
Agricultural Feedlots															
Private Capital	5	5	6	6	6	6	5	4	3	3	3	2	3	3	3
Private Operating	1	1	2	2	4	4	4	4	4	5	6	7	8	8	8

Sources for Table E-1

Soil conservation expenditures are derived from a diverse number of sources. The primary data sources include:

"Conservation and Erosion Control Costs in the United States," G. Pavelis, USDA, Economic Research Service, ERS Staff Report No. AGES850423, July 1985.

"Conservation capital in the United States, 1935-1980," *Journal of Soil and Water Conservation*, G. Pavelis, Nov-Dec, 1983.

"1980 Appraisal Part I: Soil, Water, and Related Resources in the United States: Status, Condition and Trends", USDA, Soil Conservation Service, March, 1981.

"Agricutural Statistics," US Department of Agriculture, various years.

Highway erosion expenditures are from the U.S. Department of Commerce, Bureau of Economic Analysis series on "Pollution Abatement and Control Expenditure." For example, the most recent data was published in June, 1989 in the *Survey of Current Business*. Cost estimates for federal expenditure can be found in Table 7, line 20, and costs for state and local governments can be found on line 23.

Costs in the *Survey of Current Business* do not differentiate between capital and operating expenditures. Therefore, federal expenditures were assumed to be 10 percent capital cost and 90 percent operating cost. State and local expenditures were assumed to be 20 percent capital costs and 80 percent operating costs. The difference is due to the degree of new construction occuring on state and local highways, versus that taking place on federal highways.

Feedlot expenditures are from the U.S. Department of Commerce, Bureau of Economic Analysis series on "Pollution Abatement and Control Expenditures." For example, the most recent data was published in June, 1989 in the *Survey of Current Business*. Cost estimates can be found in Table 7, line 6 for capital, and line 12 for operating expenditures.

APPENDIX F
ESTIMATION OF WATER POLLUTION CONTROL COSTS

This appendix provides component costs and background documentation for the derivation of the historical water quality and drinking water cost estimates presented in Chapter 4. These two categories of water costs are discussed separately below.

F.1. WATER QUALITY COSTS

Estimates of historical water quality costs were derived from three different sources. Estimates of private sector costs were derived from the "Pollution Abatement and Control Expenditures" (PACE) reports published annually in the *Survey of Current Business* by the U.S. Department of Commerce. These costs represent private expenditures to control industrial effluents in compliance with NPDES permits and for the pretreatment of discharges to municipal wastewater treatment facilities.

Estimates of state and local costs were derived from annual *Government Finances* reports published by the U.S. Census Bureau. The Census data show state and local water quality program implementation costs as well as wastewater treatment and sewerage costs. Adjustments were made to the Census data to remove all indirect expenditures associated with Federal and state grants to state and local governments. In addition, 20 percent of state and local costs reported as "natural resources" costs in the Census data were added to state and local wastewater treatment and sewerage costs. This adjustment was made to include that portion of natural resource costs which are believed to be related to water quality.

Finally, estimates of EPA water quality costs which, for the most part, represent Federal grants to state and local governments for NPDES program implementation and wastewater treatment, respectively, were derived from annual "Justification of Appropriation Estimates for Committee on Appropriations" documents.

Table F-1 presents cost data from the *Government Finances* series. Table F-2 presents data on Federal grants. Table F-3 contains local capital expenditures for sewerage and wastewater treatment adjusted to exclude Federal grants to local governments. Table F-4 presents estimates of total state and local water quality expenditures which include that portion of natural resource expenditures directed to water quality and exclude Federal grants for wastewater treatment. Table F-5 presents state, local, and private water quality costs in current dollars broken into capital and O&M cost components. Table F-6 shows these costs in constant 1986 dollars, and Table F-7 shows the conversion of cost estimates from fiscal years into calendar years.

F.2. DRINKING WATER TREATMENT COSTS

The Safe Drinking Water Act (SDWA) of 1974 initiated a regulatory program to develop and enforce uniform national quality standards to assure the safety of public drinking water supplies. The SDWA called for promulgation of National Interim Primary Drinking Water Regulations (NIPDWR) while final regulations were being developed. The Final EPA rule specifying the NIPDWR for inorganic and microbiological contaminants was published in the Federal Register in December of 1976. State enforcement was required to begin within 18 months. Another rule, the Total Trihalomethane (TTHM) regulation directed to controlling the most common forms of harmful by-products of chlorine disinfection, was finalized in November of 1979. Together, the TTHM rule and the interim regulations have accounted for the majority of SDWA-induced compliance expenditures to date.

Final National Primary Drinking Water Regulations for fluoride, volatile organic chemicals (VOCs), surface water treatment, and coliforms were promulgated only recently and thus have only just begun to impose costs. These and other forthcoming rules for the remainder of the 83 contaminants listed in the 1986 Amendments to the SDWA are expected to add significantly to compliance costs over the next several years.

Total drinking water treatment costs are shown in Tables F-8 through F-11. The data in the tables are broken down into three time periods corresponding to the appropriate regulatory phases:

The **Pre-Regulatory Period** covering years prior to 1978, during which there were no effective regulations under the SDWA;

The **Interim (NIPDWR/TTHM) Period** covering years 1978-1988, during which the interim primary regulations and the trihalomethane rule were the only effective SDWA regulations; and

The **1986 SDWA Amendments Period** covering years 1989-2000, during which compliance costs pursuant to the SDWA 1986 amendments have and will be incurred.

The focus of this section of Appendix F is costs associated with treating public drinking water supplies as opposed to costs directly related to providing public water (*e.g.* costs for water mains). The *Government Finances* series, from which data presented in columns B and C of Tables F-8 and F-9 (data from Table F-8 indexed to 1986 dollars) were obtained, reports not only the local government costs associated with drinking water treatment, but also costs for supplying water to the public. Since they are not directly related to costs incurred for assuring the safety of public drinking water, estimated water supply costs were removed from the *Government Finances* series data. The costs that remain (costs for water treatment) are shown in columns F and G of Tables F-8 and F-9. Figures 1 and 2 present costs for water treatment, while Figures 3 and 4 present total drinking water costs, including costs for water supply and treatment, disaggregated into baseline and SDWA expenditures.

F.2.1. *Expenditures During The Pre-Regulatory Period*

Even before Federal regulations regarding drinking water quality were promulgated, municipalities and private water suppliers incurred treatment costs to assure acceptable taste and odor and to avoid outbreaks of acute waterborne diseases. The U.S. Public Health Service published voluntary standards in 1962 which were followed widely.

A November, 1977 EPA report entitled, *The Cost of Water Supply And Water Utility Management*, summarizes the results of research conducted by the Municipal Environmental Research Laboratory that provides insights into the cost of treating water in the pre-regulatory period. Detailed case studies of 12 municipal water utilities of various sizes and geographic locations were prepared. A time series of cost data was developed for each utility covering the period 1965 through 1974. The results indicate that, on average, 12.4 percent of total drinking water supply O&M costs were devoted to water treatment. These data were used to calculate that portion of total drinking water O&M costs devoted to treatment during the pre-regulatory period.

Unfortunately this report analyzed capital costs in terms of annual interest and depreciation costs only, which is not compatible with capital outlays, the focus of our analysis. A 1977 Commerce Department study entitled, *The 1977 Market for Water And Wastewater Treatment Equipment*, provides a time series of data that permits a comparison of capital outlays for drinking water treatment to total capital outlays by the water industry. For the period 1965 through 1974, the data indicate that capital outlays for water treatment were 18.4 percent of total capital outlays by drinking water suppliers. These data were used to calculate that portion of total drinking water capital costs that were devoted to treatment during the pre-regulatory period.

F.2.2. *The Interim Period*

In August 1980, EPA published a report entitled, *Water Utility Financing Study: National Costs of The Interim Primary Drinking Water Regulations*. This report estimated that treatment processes to be installed pursuant to the NIPDWR would result in capital outlays of $1.49 billion and O&M costs of $231 million per year. The total national cost of associated monitoring requirements was not estimated.

The forecasts on which the Water Utility Financing Study was based did not, for the most part, materialize. Monitoring data revealed that inorganic chemical contamination of supplies was not as extensive as had been supposed. The inorganic chemical portions of the NIPDWR were modeled after the 1962 U.S. Public Health Service Standards, and many public water systems were already meeting these standards. It is believed that relatively little compliance activity has actually been required regarding inorganic chemicals, which accounted for the bulk of forecasted expenditures.

In contrast, monitoring for microbiological contamination has revealed a significant number of problems requiring resolution. The microbiological portion of the total and compliance expenditures forecast in the Water Utility Financing Study included capital outlays of $343 million and O&M costs of $38 million. The declines measured in the number of violators of microbiological standards suggests that these compliance costs were realized.

In the September 1979 report, *Economic Impact Analysis of The Promulgated Trihalomethane Regulation For Drinking Water*, EPA estimated that total compliance costs for this rule would include capital outlays of $104 million and O&M costs of $14 million per year. Monitoring costs were not included in the analysis. In 1986, the American Water Works Association

Research Foundation conducted a survey of a statistical sampling of water systems to assess trihalomethane compliance and to estimate compliance costs. By extrapolation, the study concludes that industry-wide capital outlays fell in a range from $31 million to $99 million while O&M expenditures range from $8 million to $29 million per year.[1]

In the report, *1984 Water Utility Operating Data*, based on a member survey conducted by the American Water Works Association, an estimate of the existing level of expenditure for monitoring of regulated contaminants is provided. Converted to 1986 dollars, the responding utilities, which serve 46 percent of the total population served by community water systems, reported expenditures totalling $53 million per year. If the utilities serving the other 54 percent of the total population served by community water systems expended proportionate amounts, the total monitoring expenditure for all community water systems would be $115 million per year.

By synthesizing the above analyses, it was possible to construct an overall estimate of SDWA compliance expenditures during the Interim period covering years 1978 through 1988. To estimate capital and O&M expenditures, it was assumed that the microbiological portion of expenditure forecasts for the NIPDWR and the trihalomethane regulation were fully realized. In addition, the estimate of monitoring costs based on the AWWA survey was used. Total O&M expenditures (including monitoring costs) over the period are estimated as $167 million per year. For capital outlays, the total estimated capital cost of $447 million for compliance with microbiological and TTHM regulations was used. This translates into an average annual capital outlay of $41 million per year over the eleven year period.

F.2.3. *The SDWA 1986 Amendments Period*

In compliance with Executive Order 12291, EPA is required to assess the total national cost of all proposed new regulations. This process has been completed for many new regulations forthcoming under the 1986 Amendments to the Safe Drinking Water Act, except for the disinfection by-products rules. It is estimated that, when fully realized, compliance with the new regulations will require additional capital outlays of roughly $1 to $2 billion per year and additional O&M expenditures (including monitoring costs) of about $1.25 billion per year throughout the mid to late 1990s.

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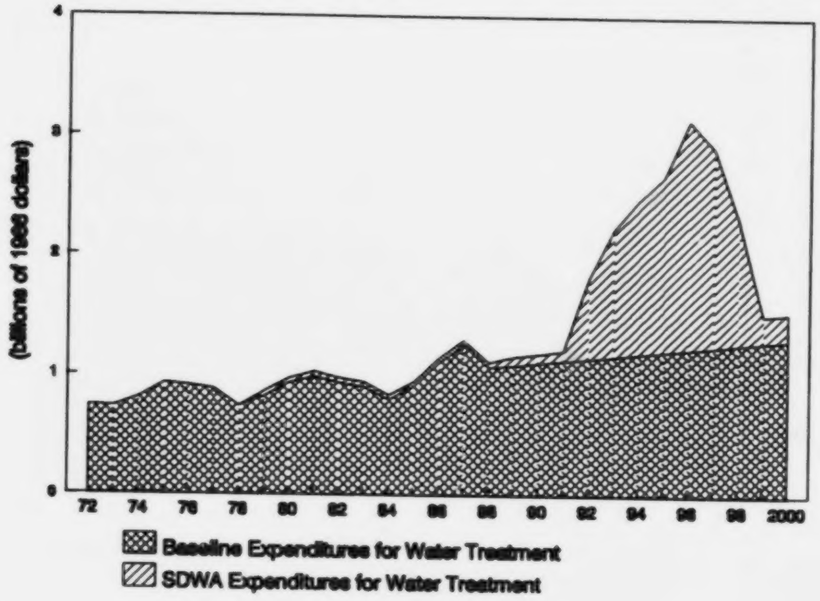
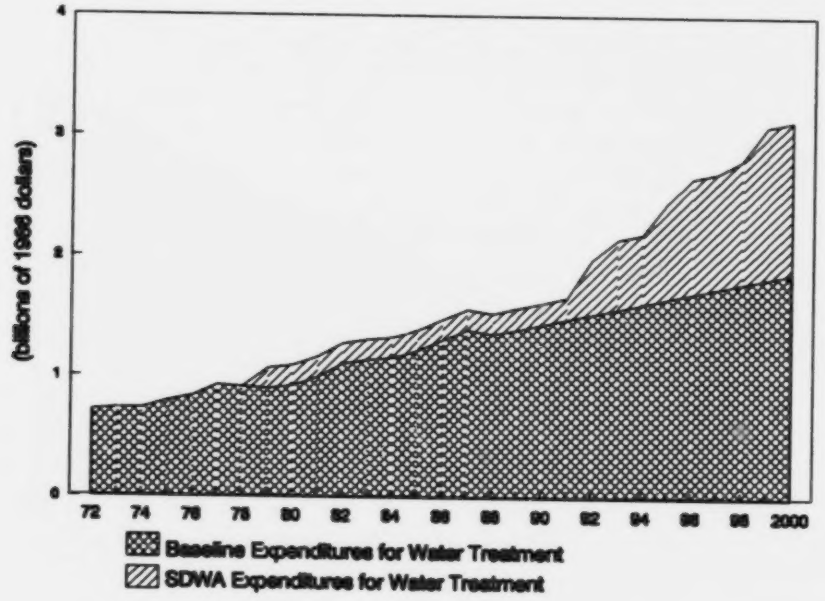
[1] McGuire, M.J. and Meadow, R.G., "AWWARF Trihalomethane Survey," *Journal of the American Water Works Association*, Vol. 80, No. 1, January 1988.

Fig. F-1: CAPITAL OUTLAYS FOR DRINKING WATER TREATMENT



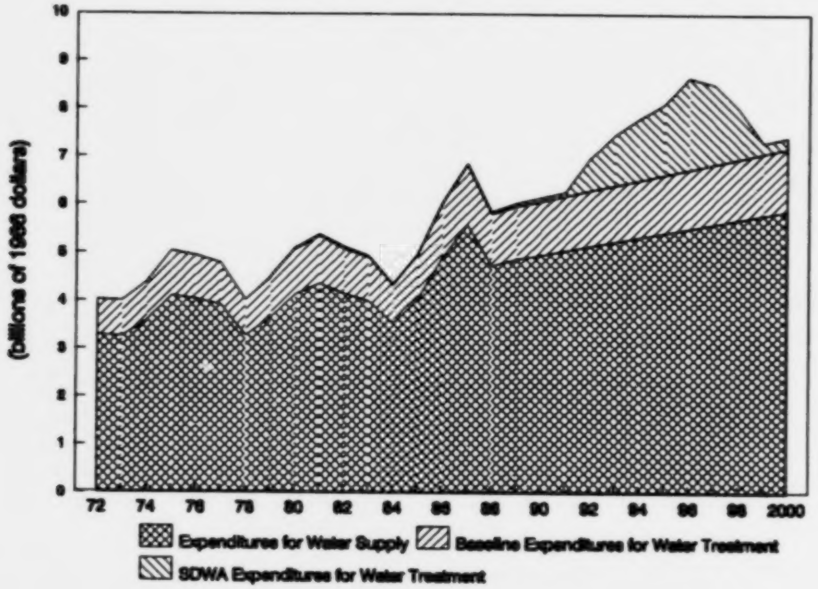
Source: Table F-9.

Fig. F-2: OPERATING EXPENDITURES FOR DRINKING WATER TREATMENT



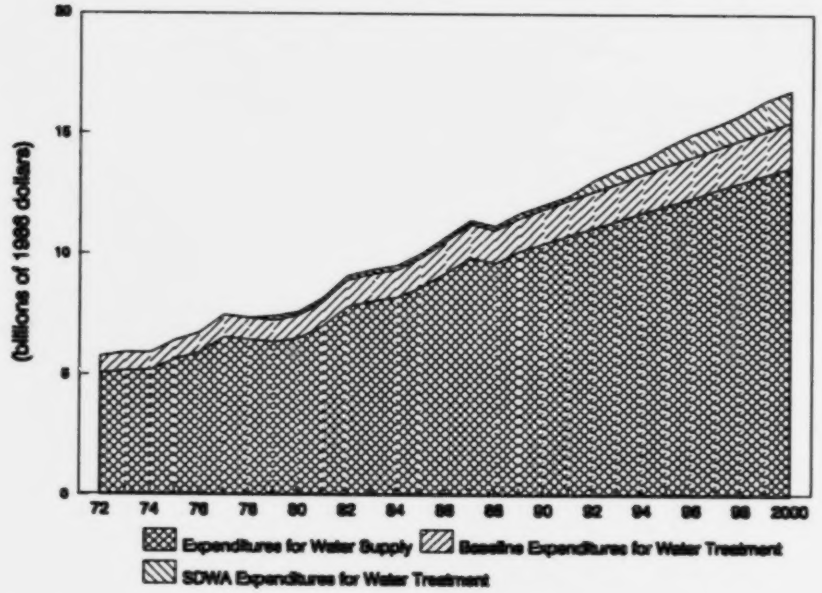
Source: Table F-9.

Fig. F-3: TOTAL CAPITAL OUTLAYS FOR DRINKING WATER SUPPLY



Source: Table F-9. Expenditures for Water Supply equals column D minus columns F and H in Table F-9.

Fig. F-4: TOTAL OPERATING EXPENDITURES FOR DRINKING WATER SUPPLY



Source: Table F-9. Expenditures for Water Supply equals column E minus columns G and I in Table F-9.

Table F-1: DATA FROM *GOVERNMENT FINANCES* SERIES

(millions of current dollars)

	EXPENDITURES FOR SEWERAGE						EXPENDITURES FOR NATURAL RESOURCES					
	Local			State			Local			State		
	Capital	O&M	Total	Capital	O&M	Total	Capital	O&M	Total	Capital	O&M	Total
	B	C	D	F	G	H	J	K	L	M	O	P
1972	2,091	1,073	3,164	0	0	0	233	407	640	542	1,928	2,470
1973	2,428	1,176	3,604	0	0	0	248	407	655	526	2,097	2,623
1974	2,640	1,440	4,080	0	0	0	290	454	744	631	2,286	2,917
1975	3,569	1,693	5,262	0	0	0	336	519	855	777	2,591	3,368
1976	3,955	1,982	5,937	0	0	0	336	685	1,021	736	2,905	3,641
1977	4,208	2,329	6,537	0	0	0	301	595	896	953	3,155	4,108
1978	4,180	2,662	6,842	185	115	300	296	688	984	348	2,893	3,241
1979	5,415	3,073	8,488	204	103	307	334	778	1,112	387	3,207	3,594
1980	6,028	3,530	9,558	243	91	334	526	859	1,385	527	3,597	4,124
1981	6,692	4,084	10,776	220	125	345	448	1,003	1,451	570	4,155	4,725
1982	5,660	4,778	10,438	235	124	359	368	980	1,348	696	4,469	5,165
1983	5,726	5,310	11,036	80	123	203	480	1,057	1,537	831	4,714	5,545
1984	5,550	5,720	11,270	113	133	246	584	1,175	1,759	829	4,833	5,662
1985	5,738	6,119	11,858	187	141	328	660	1,302	1,962	1,076	5,319	6,395
1986	6,296	6,670	12,966	165	177	341	727	1,449	2,176	1,076	5,822	6,897
1987	7,114	7,342	14,456	192	213	406	745	1,639	2,384	1,261	6,093	7,354

Footnotes for Table F-1 by Column

EXPENDITURES FOR SEWERAGE:

B **Local Capital Expenditures for Sewerage** from *Government Finance* series. Used "Total Capital Outlay" under Direct Expenditures. For 1985-1987 see Table 8; for 1977 and 1981-1984 see Table 14; for 1978-1980 see Table 13; and for 1972-1976 see Table 9.

C **Local O&M Expenditures for Sewerage** from *Government Finance* series. Used "Current Operation" under Direct Expenditures. For 1985-1987, see Table 8. For 1984 and earlier, Local O&M was calculated in the spreadsheet by subtracting local capital expenditures (column B) from total local expenditures (column D).

D **Total Local Expenditures for Sewerage** from *Government Finance* series. Used "Total" under Direct Expenditures. For 1985-1987 see Table 8; for 1977 and 1981-1984 see Table 11; for 1978-1980 see Table 10; and for 1972-1976 see Table 7.

F **State Capital Expenditures for Sewerage** from *Government Finance* series. Used "Total Capital Outlay" under Direct Expenditures. For 1985-1987 see Table 8; for 1977 and 1981-1984 see Table 14; for 1978-1980 see Table 13; and for 1972-1976 see Table 9.

G **State O&M Expenditures for Sewerage** from *Government Finance* series. Used "Current Operation" under Direct Expenditures. For 1985-1987, see Table 8. For 1984 and earlier, State O&M was calculated in the spreadsheet by subtracting state capital expenditures (column F) from total state expenditures (column H).

H **Total State Expenditures for Sewerage** from *Government Finance* series. Used "Total" under Direct Expenditures. For 1985-1987 see Table 8; for 1977 and 1981-1984 see Table 11; for 1978-1980 see Table 10; and for 1972-1976 see Table 7.

EXPENDITURES FOR NATURAL RESOURCES:

J **Local Capital Expenditures for Natural Resources** from *Government Finance* series. Used "Total Capital Outlay" under Direct Expenditures. For 1985-1987 see Table 8; for 1977 and 1981-1984 see Table 14; for 1978-1980 see Table 13; and for 1972-1976 see Table 9.

K **Local O&M Expenditures for Natural Resources** from *Government Finance* series. Used "Current Operation" under Direct Expenditures. For 1985-1987, see Table 8. For 1984 and earlier, Local O&M was calculated in the spreadsheet by subtracting local capital expenditures (column J) from total local expenditures (column L).

L **Total Local Expenditures for Natural Resources** from *Government Finance* series. Used "Total" under Direct Expenditures. For 1985-1987 see Table 8; for 1977 and 1981-1984 see Table 11; for 1978-1980 see Table 10; and for 1972-1976 see Table 7.

N **State Capital Expenditures for Natural Resources** from *Government Finance* series. Used "Total Capital Outlay" under Direct Expenditures. For 1985-1987 see Table 8; for 1977 and 1981-1984 see Table 14; for 1978-1980 see Table 13; and for 1972-1976 see Table 9.

O **State O&M Expenditures for Natural Resources** from *Government Finance* series. Used "Current Operation" under Direct Expenditures. For 1985-1987, see Table 8. For 1984 and earlier, State O&M was calculated in the spreadsheet by subtracting state capital expenditures (column N) from total state expenditures (column P).

P **Total State Expenditures for Natural Resources** from *Government Finance* series. Used "Total" under Direct Expenditures. For 1985-1987 see Table 8; for 1977 and 1981-1984 see Table 11; for 1978-1980 see Table 10; and for 1972-1976 see Table 7.

Table F-2: FEDERAL GRANT ADJUSTMENTS

(millions of current dollars)

	EPA Construction Grants (Title II)*		EPA Water Quality Grants to States			
			Section 106**	Section 205(g)***	Section 205(j)***	Total
	R	T	U	W	Y	AA U+W+Y
1972	413 #		15 #			15
1973	684 #		20 #			20
1974	1,553 #		50 #			50
1975	1,938	Actual:	46			46
1976	2,790 ##	2429	46			46
1977	3,169 ##	3530	51			51
1978	3,187		53			53
1979	3,756		54			54
1980	4,343		49			49
1981	3,881		51			51
1982	3,756		51	50		101
1983	2,983		54	127	34	215
1984	2,623		54	83	23	160
1985	2,900		61	100 #	24 #	185
1986	3,113		62	93	19	174
1987	2,920		71	82	30	183

Footnotes for Table F-2

* Amounts are actual outlays from the annual Justification of Appropriation Estimates for Committee on Appropriations; except for those noted by #, which are adjusted outlays

## An adjustment for transition quarter was made where noted by ##, as follows:

$2429 for 1976 and $3187 for 1978 sum to $5616, that sum divided by 2 equals $2808, the $3530 for 1977 minus $2808 equals $722; one-half of the $722 or $361 is distributed to 1976 [$2429 + $361 = $2790] and to 1977 [$2808 + $361 = $3169]

** Amounts are actual obligations from the annual Justification of Appropriation Estimates for Committee on Appropriations, except for those noted by #, which are budget authority

*** Amounts are actual obligations from the annual Justification of Appropriation Estimates for Committee on Appropriations, except for that noted by #, which is estimated obligations

R **EPA Construction Grants.** Title II Construction Grants began in 1972. Amounts are actual outlays from the annual Justification of Appropriation Estimates for Committee on Appropriations.

The amounts for 1976 and 1977 were adjusted to account for the transition quarter. The adjustment is made as follows: the actual outlays of $2429 for 1976 and $3187 for 1978 sum to $5616 and that sum divided by 2 equals $2808. The actual outlay of $3530 for 1977 minus $2808 equals $722. One-half of $722 or $361 is distributed to 1976 ($2429 + $361 = $2790) and the other half to 1977 ($2808 + $361 = $3169).

T Amounts for 1976 and 1977 are actual outlays from the annual Justification of Appropriation Estimates for Committee on Appropriations. The actual outlays for these two years were adjusted in (column R) to account for the transition quarter.

U **Section 106 grants**. Amounts are from the annual Justification of Appropriation Estimates for Committee on Appropriations, under the Abatement, Control and Compliance appropriation. For 1972-1974, amounts are budget authority. For 1975-1988, amounts are actual obligations.

W **Section 205(g) grants**. Amounts are from the annual Justification of Appropriation Estimates for Committee on Appropriations. Amounts are actual obligations, except for 1985 which is estimated obligations. Section 205 grants are under the Construction Grants appropriation. States receive section 205 funds as reserves from their Construction Grants allotment. Section 205(g) obligations started in 1982.

Y **Section 205(j) grants**. Amounts are from the annual Justification of Appropriation Estimates for Committee on Appropriations. Amounts are actual obligations, except for 1985 which is estimated obligations. Section 205 grants are under the Construction Grants appropriation. States receive section 205 funds as reserves from their Construction Grants allotment. Section 205(j) obligations started in 1983.

AA **Total EPA Water Quality Grants to States**. Amounts are the sum of section 106, 205(g), and 205(j) grants.

Table F-3: CALCULATION OF LOCAL WASTEWATER CAPITAL

(millions of current dollars)

	Adjusted EPA Construction Grants (EPA Const Grants - amount reserved for Section 205	Own Source: (Local Sewerage Capital - Adjusted EPA Const Grants)	Local Const Grants: (Local Match of Adj EPA Const Grants)	Local Match Formula	Local Wastewater Capital: (Own Source - Local Const Grants)
	AC R-(W+Y)	AE (B-AC)	AG AC*(Local Share)	AI (Local/Fed)	AK (AE-AG)
1972	413	1,678	103	(0.25/0.75)	1,575
1973	684	1,744	171	(0.25/0.75)	1,573
1974	1,553	1,087	388	(0.25/0.75)	699
1975	1,938	1,631	485	(0.25/0.75)	1,147
1976	2,790	1,165	698	(0.25/0.75)	468
1977	3,169	1,039	792	(0.25/0.75)	247
1978	3,187	993	797	(0.25/0.75)	196
1979	3,756	1,659	939	(0.25/0.75)	720
1980	4,343	1,685	1,086	(0.25/0.75)	599
1981	3,881	2,811	970	(0.25/0.75)	1,841
1982	3,706	1,954	927	(0.25/0.75)	1,028
1983	2,822	2,904	706	(0.25/0.75)	2,199
1984	2,517	3,033	629	(0.25/0.75)	2,404
1985	2,776	2,962	1,249	(0.45/0.55)	1,713
1986	3,001	3,295	1,350	(0.45/0.55)	1,945
1987	2,808	4,306	1,264	(0.45/0.55)	3,042

Footnotes for Table F-3

AC **Adjusted EPA Construction Grants**. Amounts for EPA Construction Grants (column R) were adjusted by subtracting amounts reserved for section 205 (the sum of column W and column Y).

AE **Own Source**. "Own Source" represents local capital expenditures for sewerage excluding federal funds from the construction grant program. "Own Source" is calculated by subtracting Adjusted EPA Construction Grants (column AC) from Local Capital Expenditures for Sewerage (column B).

AG **Local Construction Grants**. "Local Construction Grants" represents the local share of construction grant financing and is calculated by multiplying the amount for Adjusted EPA Construction Grants (column AC) by the local share of the "Local Match Formula." For 1972-1984, the local share is 25 percent. For 1985-1987, the local share is 45 percent.

AI **Local Match Formula**. This column presents the formula to determine the local share of the Local/Federal match for construction grants. Title II of the 1972 Federal Water Pollution Control Act established the construction grant program, with the local share for construction financing at 25 percent and the federal share at 75 percent. The 1981 Amendments to the Clean Water Act increased the local share to 45 percent and decreased the federal share to 55 percent for grant awards beginning in 1985.

AK **Local Wastewater Capital**. "Local Wastewater Capital" represents local capital expenditures for sewerage excluding local funds for construction grants. "Local Wastewater Capital" is calculated by subtracting Local Construction Grants (column AG) from "Own Source" (column AE).

Table F-4: ADJUSTMENT FOR 20 PERCENT OF NATURAL RESOURCE EXPENDITURES

(millions of current dollars)

	Adjusted State		Adjusted Local					
Year	Capital	O&M	Capital			O&M		
	AM F+(.2*N)	AN G+(.2*O)-AA	AO AK+(.2*J)	AP (1)	AQ AO+AP	AR C+(.2*K)	AS (2)	AT AR+AS
1972	108	371	1,621	29	1,650	1,154	3	1,157
1973	105	399	1,623	55	1,678	1,257	4	1,261
1974	126	407	757	78	835	1,531	5	1,536
1975	155	472	1,214	67	1,281	1,797	7	1,804
1976	147	535	535	78	613	2,119	9	2,128
1977	191	580	307	88	395	2,448	10	2,458
1978	255	641	255	143	398	2,800	10	2,810
1979	281	690	787	109	896	3,229	12	3,241
1980	348	761	704	93	797	3,702	13	3,715
1981	334	905	1,930	85	2,015	4,285	18	4,303
1982	374	917	1,101	91	1,192	4,974	17	4,991
1983	246	851	2,295	79	2,374	5,521	18	5,539
1984	279	940	2,521	94	2,615	5,955	20	5,975
1985	402	1,020	1,845	115	1,960	6,379	12	6,391
1986	380	1,167	2,090	86	2,176	6,960	12	6,972
1987	444	1,249	3,191	82	3,273	7,670	15	7,685

Footnotes for Table F-4

Natural Resources spending is defined by the Bureau of the Census as government activities to conserve, promote, and develop agriculture, fish and game, forestry, and other oil and water resources, including geological research, flood control, irrigation, drainage and conservation activities. After consultation with the Governments Division, Bureau of the Census, it was determined that 20 percent of Natural Resources expenditures represent Water Quality expenditures. Based on this assumption, amounts for Water Quality expenditures were adjusted to add 20 percent of Natural Resources expenditures.

AM **Adjusted State Water Quality Capital Expenditures.** State Capital Expenditures for Sewerage (column F) were adjusted by adding 20 percent of State Capital Expenditures for Natural Resources (column N).

AN **Adjusted State Water Quality O&M Expenditures.** State O&M Expenditures for Sewerage (column G) were adjusted by adding 20 percent of State O&M Expenditures for Natural Resources (column O). The result is adjusted by subtracting the amount for Total EPA Water Quality Grants to States (column AA).

AQ **Adjusted Local Water Quality Capital Expenditures.** Local Capital Expenditures for Sewerage (column AK) were adjusted by adding 20 percent of Local Capital Expenditures for Natural Resources (column J).

AT **Adjusted Local Water Quality O&M Expenditures.** Local O&M Expenditures for Sewerage (column C) were adjusted by adding 20 percent of Local O&M Expenditures for Natural Resources (column K).

Table F-5: WATER QUALITY RAW DATA RECAPITULATED IN TOTALS FOR CAPITAL & OPERATING COSTS

(millions of current dollars)

	Source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
	Capital																
1	State Govt	108	105	126	155	147	191	255	281	348	334	374	246	279	402	380	444
2	Local Govt	1,650	1,678	835	1,281	613	395	398	896	797	2,015	1,192	2,374	2,615	1,960	2,176	3,273
3	Private	2,767	3,206	3,190	3,579	4,161	4,556	5,000	5,291	5,030	4,760	4,814	5,005	5,655	5,750	5,784	5,945
	Operating																
4	State Govt	371	399	407	472	535	580	641	690	761	905	917	851	940	1,020	1,167	1,249
5	Local Govt	1,157	1,261	1,536	1,804	2,128	2,458	2,810	3,241	3,715	4,303	4,991	5,539	5,975	6,391	6,972	7,685
6	Private																
7	Abatement	1,073	1,256	1,512	1,802	2,184	2,587	2,922	3,425	3,848	4,357	4,454	5,084	5,588	6,035	6,445	7,236
8	Res & Dev	64	73	57	68	78	91	99	107	110	108	116	167	172	181	190	199
9	Total Priv	1,137	1,329	1,569	1,870	2,262	2,678	3,021	3,532	3,958	4,465	4,570	5,251	5,760	6,216	6,635	7,435

Footnotes to Table F-5 for line:

1 Figures from Column AM, Table F-4

2 Figures from Column AQ, Table F-4

3 Figures from *Survey of Current Business*: 1972-1982 data from July 1986, Pollution abatement and control, Pollution Abatement, Business, On capital account, Table 9, Line 7; 1983-1987 figures from June 1989, Pollution abatement and control, Pollution Abatement, Business, On capital account, Table 6, Line 7

4 Figures from Column AN, Table F-4

5 Figures from Column AT, Table F-4

7 Figures from *Survey of Current Business*: 1972-1982 data from July 1986, Pollution abatement and control, Pollution Abatement, Business, On current account, Private, Table 9, Line 9; 1983-1987 figures from June 1989, Pollution abatement and control, Pollution Abatement, Business, On current account, Private, Table 6, Line 9

8 Figures from *Survey of Current Business*: 1972-1982 data from July 1986, Pollution abatement and control, Research and development, Private, Table 9, Line 20; 1983-1987 figures from June 1989, Pollution abatement and control, Research and development, Private, Table 6, Line 20

9 Sum of lines 7 and 8

Table F-6: WATER QUALITY RAW DATA CONVERTED FROM CURRENT DOLLARS INTO 1986 DOLLARS

(millions of 1986 dollars)

	Source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
	Capital																
1	State Govt	274	247	269	313	278	335	405	401	460	409	440	274	301	409	380	431
2	Local Govt	4,170	3,942	1,780	2,581	1,157	695	634	1,276	1,053	2,469	1,401	2,638	2,818	1,994	2,176	3,173
3	Private	7,096	7,764	6,769	6,931	7,578	7,737	7,832	7,518	6,577	5,673	5,445	5,427	5,841	5,786	5,784	5,857
	Operating																
4	State Govt	936	939	868	952	1,011	1,020	1,019	983	1,005	1,109	1,077	946	1,013	1,037	1,167	1,210
5	Local Govt	2,925	2,964	3,275	3,635	4,020	4,324	4,467	4,615	4,904	5,272	5,864	6,158	6,441	6,502	6,972	7,450
6	Private	3,338	3,666	3,658	3,816	4,282	4,682	4,907	5,227	5,149	5,227	5,018	5,598	5,900	6,244	6,635	7,368
	Fixed-weighted indexes																
7	Priv Capital	0.390	0.413	0.471	0.516	0.549	0.589	0.638	0.704	0.765	0.839	0.884	0.922	0.968	0.994	1.000	1.015
8	Priv Operating	0.341	0.362	0.429	0.490	0.528	0.572	0.616	0.676	0.769	0.854	0.911	0.938	0.976	0.995	1.000	1.009
9	Government	0.396	0.426	0.469	0.496	0.529	0.569	0.629	0.702	0.757	0.816	0.851	0.900	0.928	0.983	1.000	1.031

Footnotes to Table F-6 for line:

1 Line 1, Table F-5, divided by line 9, Table F-6

2 Line 2, Table F-5, divided by line 9, Table F-6

3 Line 3, Table F-5, divided by line 7, Table F-6

4 Line 4, Table F-5, divided by line 9, Table F-6

5 Line 5, Table F-5, divided by line 9, Table F-6

6 Line 9, Table F-5, divided by line 8, Table F-6

Table F-7: CONVERSION OF WATER QUALITY FISCAL YEAR FIGURES TO CALENDAR YEAR FIGURES

(millions of 1986 dollars)

	Source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
	Capital																
1	State Govt	261	258	291	296	307	370	403	430	435	424	357	287	355	395	405	431
2	Local Govt	4,056	2,861	2,181	1,869	926	664	955	1,164	1,761	1,935	2,020	2,728	2,406	2,085	2,675	3,173
3	Private	7,096	7,764	6,769	6,931	7,578	7,737	7,832	7,518	6,577	5,673	5,445	5,427	5,841	5,786	5,784	5,857
	Operating																
4	State Govt	938	903	910	981	1,015	1,019	1,001	994	1,057	1,093	1,012	979	1,025	1,102	1,189	1,210
5	Local Govt	2,944	3,120	3,455	3,828	4,172	4,395	4,541	4,760	5,088	5,568	6,011	6,299	6,472	6,737	7,211	7,450
6	Private	3,338	3,666	3,658	3,816	4,282	4,682	4,907	5,227	5,149	5,227	5,018	5,598	5,900	6,244	6,635	7,368

Footnotes to Table F-7 for line:

1, 2, 4, and 5. The 1972 calendar year expenditure equals the average of 1972 and 1973 fiscal year figures from Table F-6. The same holds true for all years except 1987, which is the 1987 figure from Table F-6.

3 and 6. Conversion was not required since data did not come from Government Finance series

Table F-8: DRINKING WATER CAPITAL AND OPERATING POLLUTION CONTROL COSTS

(millions of current dollars)

	Local Govt Expenditures For Water Supply		Total Expenditures For Water Supply		Baseline Expenditure For Water Treatment		SDWA Expenditures For Water Treatment		Total Expenditures For Water Treatment	
Year	Capital Outlays	O&M Expenditure	Capital Outlays	O&M Expenditures	Capital Outlays	O&M Expenditures	Capital Outlays	O&M Expenditures	Capital Outlays	O&M Expenditures
A	B	C	D	E	F	G	H	I	J	K
PRE-REGULATORY PERIOD										
1972	1,343	1,924	1,589	2,276	292	282	0	0	282	282
1973	1,435	2,120	1,698	2,508	312	311	0	0	311	311
1974	1,743	2,340	2,062	2,768	379	343	0	0	343	343
1975	2,111	2,686	2,497	3,178	460	394	0	0	394	394
1976	2,208	3,012	2,612	3,563	481	442	0	0	442	442
1977	2,302	3,588	2,723	4,245	501	526	0	0	526	526
1978	2,136	3,907	2,527	4,622	465	573	0	0	573	573
NIPDWR/TTHM PERIOD										
1979	2,671	4,399	3,160	5,204	576	631	28	118	659	748
1980	3,270	4,857	3,868	5,746	706	697	30	127	727	824
1981	3,718	5,634	4,398	6,665	803	810	33	137	842	946
1982	3,684	6,530	4,358	7,725	796	940	34	142	974	1,083
1983	3,753	7,105	4,440	8,405	810	1,024	36	151	1,060	1,174
1984	3,420	7,445	4,046	8,807	738	1,073	37	155	1,110	1,228
1985	4,133	8,301	4,889	9,820	892	1,197	39	165	1,237	1,362
1986	5,108	9,041	6,043	10,696	1,105	1,305	40	167	1,345	1,473
1987	5,982	9,936	7,077	11,754	1,295	1,436	41	173	1,477	1,609

Footnotes for Table F-8

FOOTNOTES FOR PRE-REGULATORY PERIOD: Expenditures for water treatment during the pre-regulatory period are computed as follows:

1. Total capital outlays (column B) and total O&M expenditures (column C) are taken from the U.S. Census *Government Finance* series for the years 1972 through 1978. These data represent **total expenditures by water systems operated by state, regional, and local government agencies.**

2. The Census data in columns B and C are multiplied by a factor of 1.183 to obtain estimates in columns D and E of **total expenditures by the water industry, including privately owned water systems that are not included in the Census of Governments.** The 1.183 factor is based on an analysis of the ratio of persons served by public versus private water systems and therefore assumes that expenditures are a function of population served.

3. Columns F and G present estimates of **baseline industry expenditures for water treatment during the pre-regulatory period.** These estimates are computed by multiplying total industry capital outlays and O&M expenditures in column D and E by 0.184 and 0.124, respectively. These factors are based on the EPA and Commerce Department studies described above.

4. Columns H and I representing **additional incremental expenditures for SDWA compliance** (above baseline expenditures for treatment) are occupied by zeros during the pre-regulatory period.

5. Columns J and K present **total expenditures for water treatment**, figured as the sums: F + H and G + I. During the pre-regulatory period, columns J and K are equivalent to columns F and G.

FOOTNOTES FOR NIPDWR/TTHM PERIOD: Expenditures for water treatment during the NIPDWR/TTHM period are computed as follows:

1. Total capital outlays (column B) and total O&M expenditures (column C) are taken from the U.S. Census *Government Finance* series for the years 1979 through 1987. The data points shown for 1988 are projections, based on linear regressions. These data represent **total expenditures by water systems operated by state, regional, and local government agencies.**

2. The Census data in columns B and C are multiplied by a factor of 1.183 to obtain estimates in columns D and E of **total expenditures by the water industry, including privately owned water systems that are not included in the Census of Governments.**

3. Columns H and I, **representing additional incremental expenditures for SDWA compliance during the NIPDWR/TTHM period**, present estimates of the costs of compliance with microbiological and trihalomethane regulations as well as monitoring costs, as discussed above.

4. Columns F and G present estimates of **baseline industry expenditures for water treatment during the NIPDWR/TTHM period.** These estimates are computed by first subtracting the SDWA expenditures of columns H and I from the total expenditures in columns D and E. Factors computed for treatment expenditures during the pre-regulatory baseline period (0.184 and 0.124) are then applied to the difference to derive an estimate of baseline treatment expenditures in the NIPDWR/TTHM period.

5. Columns J and K present **total expenditures for water treatment**, figured as the sums: F + H and G + I.

An alternative source for state government expenditures for implementing the 1986 Safe Drinking Water Act Amendments is *State Costs of Implementing the 1986 Safe Drinking Water Act Amendments*, August 1989, published by U. S. Environmental Protection Agency, Office of Drinking Water and Association of State Drinking Water Administrators.

Table F-9: DRINKING WATER CAPITAL AND OPERATING POLLUTION CONTROL COSTS

(millions of 1986 dollars)

	Local Govt Expenditures For Water Supply		Total Expenditures For Water Supply		Baseline Expenditure For Water Treatment		SDWA Expenditures For Water Treatment		Total Expenditures For Water Treatment	
Year	Capital Outlays	O&M Expenditure	Capital Outlays	O&M Expenditures	Capital Outlays	O&M Expenditures	Capital Outlays	O&M Expenditures	Capital Outlays	O&M Expenditures
A	B	C	D	E	F	G	H	I	J	K
PRE-REGULATORY PERIOD										
1972	3394	4862	4015	5751	739	713	0	0	739	713
1973	3372	4982	3989	5894	734	731	0	0	734	731
1974	3717	4990	4397	5903	809	732	0	0	809	732
1975	4255	5413	5033	6404	926	794	0	0	926	794
1976	4171	5690	4934	6731	908	835	0	0	908	835
1977	4049	6311	4790	7466	881	926	0	0	881	926
1978	3396	6212	4018	7349	739	911	0	0	739	911
NIPDWR/TTHM PERIOD										
1979	3804	6265	4500	7412	821	898	40	167	861	1066
1980	4317	6412	5107	7586	932	920	40	167	972	1087
1981	4555	6903	5389	8166	984	992	40	167	1024	1159
1982	4329	7673	5121	9077	935	1105	40	167	975	1272
1983	4172	7898	4935	9344	901	1138	40	167	941	1305
1984	3687	8026	4361	9494	795	1157	40	167	835	1324
1985	4205	8445	4974	9990	908	1218	40	167	948	1385
1986	5108	9041	6043	10696	1105	1305	40	167	1145	1473
1987	5799	9633	6861	11395	1255	1392	40	167	1295	1560
1988	4945	9418	5850	11142	1069	1361	40	167	1109	1528
SDWA 1986 AMENDMENTS PERIOD										
1989	5039	9727	6032	11685	1086	1397	71	178.1	1157	1575
1990	5133	10036	6147	12050	1106	1440	74	178.1	1180	1618
1991	5227	10344	6270	12417	1126	1484	86	179.3	1212	1663
1992	5322	10653	6967	13061	1146	1527	672	458.3	1818	1985
1993	5416	10962	7465	13548	1166	1570	1058	579.8	2224	2150
1994	5510	11270	7811	13913	1185	1614	1292	579.8	2478	2194
1995	5604	11579	8099	14501	1205	1657	1470	802.6	2675	2460
1996	5698	11888	8651	15016	1225	1700	1910	953.1	3135	2654
1997	5793	12197	8517	15382	1245	1744	1664	953.1	2909	2697
1998	5887	12505	8016	15820	1265	1787	1052	1026	2316	2813
1999	5981	12814	7301	16418	1284	1831	225	1259.3	1510	3090
2000	6075	13123	7412	16783	1304	1874	225	1259.3	1530	3133

Footnotes for Table F-9

FOOTNOTES FOR PRE-REGULATORY PERIOD: Expenditures for water treatment during the pre-regulatory period are computed as follows:

1. Total capital outlays (column B) and total O&M expenditures (column C) are taken from the U.S. Census *Government Finance* series for the years 1972 through 1978. Figures represent corresponding figures from Table F-8 divided by indexes from Table F-6, line 9. These data represent **total expenditures by water systems operated by state, regional, and local government agencies.**

2. The Census data in columns B and C are multiplied by a factor of 1.183 to obtain estimates in columns D and E of **total expenditures by the water industry, including privately owned water systems that are not included in the Census of Governments.** The 1.183 factor is based on an analysis of the ratio of persons served by public versus private water systems and therefore assumes that expenditures are a function of population served.

3. Columns F and G present estimates of **baseline industry expenditures for water treatment during the pre-regulatory period**. These estimates are computed by multiplying total industry capital outlays and O&M expenditures in column D and E by 0.184 and 0.124, respectively. These factors are based on the EPA and Commerce Department studies described above.

4. Columns H and I representing **additional incremental expenditures for SDWA compliance** (above baseline expenditures for treatment) are occupied by zeros during the pre-regulatory period.

5. Columns J and K present **total expenditures for water treatment**, figured as the sums: F + H and G + I. During the pre-regulatory period, columns J and K are equivalent to columns F and G.

FOOTNOTES FOR NIPDWR/TTHM PERIOD: Expenditures for water treatment during the NIPDWR/TTHM period are computed as follows:

1. Total capital outlays (column B) and total O&M expenditures (column C) are taken from the U.S. Census *Government Finance* series for the years 1979 through 1987. Figures represent corresponding figures from Table F-8 divided by indexes from Table F-6, line 9, for the years 1979-1987. The data points shown for 1988 are projections, based on linear regressions. These data represent **total expenditures by water systems operated by state, regional, and local government agencies.**

2. The Census data in columns B and C are multiplied by a factor of 1.183 to obtain estimates in columns D and E of **total expenditures by the water industry, including privately owned water systems that are not included in the Census of Governments.**

3. Columns H and I, **representing additional incremental expenditures for SDWA compliance during the NIPDWR/TTHM period**, present estimates of the costs of compliance with microbiological and trihalomethane regulations as well as monitoring costs, as discussed above.

4. Columns F and G present estimates of **baseline industry expenditures for water treatment during the NIPDWR/TTHM period**. These estimates are computed by first subtracting the SDWA expenditures of columns H and I from the total expenditures in columns D and E. Factors computed for treatment expenditures during the pre-regulatory baseline period (0.184 and 0.124) are then applied to the difference to derive an estimate of baseline treatment expenditures in the NIPDWR/TTHM period.

5. Columns J and K present **total expenditures for water treatment**, figured as the sums: F + H and G + I.

FOOTNOTES FOR SDWA 1986 AMENDMENTS PERIOD: Expenditures were projected based on an analysis of national impact estimates from final regulations on Flouride, Volatile Organic Chemicals, Surface Water Treatment, and Total Coliforms; proposed regulations for Phase II Synthetic Organic and Inorganic Chemicals, Lead and Copper; and prospective regulations covering Radionuclides, Phase V Synthetic Organic and Inorganic Chemicals, Arsenic, and Mandatory Disinfection of all public water supplies (from U.S. Environmental Protection Agency, Office of Drinking Water, *Estimates of the Total Benefits and Total Costs Associated with Implementation of the 1986 Amendments to the Safe Drinking Water Act*, November, 1989). It does not include estimated benefits and costs of forthcoming regulations governing disinfection by-products as the rulemaking is preliminary.

1. Columns F and G present projections of **baseline industry expenditures for water treatment during the SDWA 1986 Amendments period**. These estimates are based on a linear regression of the trend exhibited in baseline industry expenditures (expenditures for treatment net of SDWA expenditures) from 1972 to 1987 (i.e., the numbers directly above these entries in columns F and G).

2. Columns H and I present the **additional incremental expenditures for SDWA compliance during the SDWA 1986 Amendments period**.

3. Columns J and K present **total expenditures for water treatment**, figured as the sums: F + H and G + I.

Table F-10: DERIVATION OF PRIVATE CAPITAL AND OPERATING COSTS

(millions of 1986 dollars)

	EXISTING				NEW			
	Local	Private	Local	Private	Local	Private	Local	Private
Year	Capital	Capital	O&M	O&M	Capital	Capital	O&M	O&M
Column	B	C	D	E	F	G	H	I
PRE-REGULATORY PERIOD								
1972	604	135	583	131	0	0	0	0
1973	600	134	597	134	0	0	0	0
1974	661	148	598	134	0	0	0	0
1975	757	169	649	145	0	0	0	0
1976	742	166	682	153	0	0	0	0
1977	720	161	756	169	0	0	0	0
1978	604	135	745	167	0	0	0	0
NIPDWR/TTHM PERIOD								
1979	703	157	871	195	0	0	0	0
1980	794	178	888	199	0	0	0	0
1981	837	187	947	212	0	0	0	0
1982	796	178	1,039	233	0	0	0	0
1983	769	172	1,066	239	0	0	0	0
1984	682	153	1,082	242	0	0	0	0
1985	774	173	1,132	254	0	0	0	0
1986	935	209	1,203	270	0	0	0	0
1987	1,058	237	1,274	285	0	0	0	0
1988	906	203	1,249	280	0	0	0	0
SDWA 1986 AMENDMENTS PERIOD								
1989	887	199	1,141	256	58	13	146	33
1990	904	202	1,177	264	61	14	146	33
1991	920	206	1,212	272	70	16	146	33
1992	936	210	1,248	279	549	123	374	84
1993	952	213	1,283	287	865	194	474	106
1994	968	217	1,318	295	1,056	236	474	106
1995	985	221	1,354	303	1,201	269	656	147
1996	1,001	224	1,389	311	1,560	349	779	174
1997	1,017	228	1,425	319	1,360	305	779	174
1998	1,033	231	1,460	327	859	192	838	188
1999	1,049	235	1,496	335	184	41	1,029	230
2000	1,066	239	1,531	343	184	41	1,029	230

Footnotes to Table F-10

The following footnotes apply for all categories:

Private drinking water costs are assumed to be 18.3 percent of local drinking water costs for population servced based on the following assumptions: 1) U.S. population of 240 million; 2) approximately 71 percent of population served by local government facilities (170.4 million) and 13 percent (31.2 million) served by private facilities. Therefore, 18.3 percent of local government costs (31.2 million divided by 170.4 million) represents private share.

Footnotes for column:

B Figures represent 81.7 percent of Column F, Table F-9

C Figures represent 18.3 percent of Column F, Table F-9

D Figures represent 81.7 percent of Column G, Table F-9

E Figures represent 18.3 percent of Column G, Table F-9

F Figures represent 81.7 percent of Column H, Table F-9

G Figures represent 18.3 percent of Column H, Table F-9

H Figures represent 81.7 percent of Column I, Table F-9

I Figures represent 18.3 percent of Column I, Table F-9

Table F-11: DRINKING WATER RECAPITULATED IN TOTALS FOR CAPITAL & OPERATING COSTS

(millions of 1986 dollars)

	Source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
	Capital																
1	State	0	0	0	0	0	0	8	41	84	81	40	76	19	27	26	37
2	Local	604	600	661	757	742	720	604	703	794	837	796	769	682	774	935	1,058
3	Private	135	134	148	169	166	161	135	157	178	187	178	172	153	173	209	237
4	Total	739	734	809	926	908	881	739	861	972	1,024	975	941	835	948	1,145	1,295
	Operating																
5	State	0	0	0	0	0	0	19	17	20	27	33	33	33	26	38	47
6	Local	583	597	598	649	682	756	745	871	888	947	1,039	1,066	1,082	1,132	1,203	1,274
7	Private	131	134	134	145	153	169	167	195	199	212	233	239	242	254	270	285
8	Total	713	731	732	794	835	926	911	1,066	1,087	1,159	1,272	1,305	1,324	1,385	1,473	1,560

Footnotes to Table F-11

1 From annual issues of Government Finances published by U.S. Department of Commerce, Bureau of the Census.

2 Figures from Column B, Table F-10

3 Figures from Column C, Table F-10

4 Sum of lines 1 - 3

5 From annual issues of Government Finances published by U.S. Department of Commerce, Bureau of the Census.

6 Figures from Column D, Table F-10

7 Figures from Column E, Table F-10

8 Sum of lines 5 - 7

Table F-12: CONVERSION OF DRINKING WATER FISCAL YEAR FIGURES TO CALENDAR YEAR FIGURES

(millions of 1986 dollars)

	Source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
	Capital																
1	State	0	0	0	0	0	4	25	63	83	60	58	47	23	27	31	18
2	Local	602	630	709	749	731	662	654	749	816	817	783	725	728	855	997	982
3	Private	135	141	159	168	164	148	146	168	183	183	175	162	163	191	223	220
4	Total	736	772	868	917	895	810	800	916	998	1,000	958	888	891	1,046	1,220	1,202
	Operating																
5	State	0	0	0	0	0	10	18	18	23	30	33	33	30	32	42	23
6	Local	590	598	623	665	719	750	808	879	918	993	1,053	1,074	1,107	1,168	1,239	1,261
7	Private	132	134	140	149	161	168	181	197	206	222	236	241	248	262	277	283
8	Total	722	731	763	814	880	919	988	1,076	1,123	1,216	1,289	1,315	1,355	1,429	1,516	1,544

Footnotes to Table F-12

1972 calendar year expenditure equals average of 1972 and 1973 fiscal year figures from Table F-11. The same holds true for all years except 1987, which is the 1987 figure from Table F-11.

APPENDIX G
ESTIMATION OF SOLID WASTE COSTS

This appendix provides documentation for the historical solid waste cost estimates presented in Chapter 5. The estimation of costs for each economic sector is first discussed. This is followed by an explanation of the methodology used to separate out that portion of total solid waste costs resulting from Federal requirements.

G.1. DERIVATION OF SOLID WASTE COSTS BY SECTOR

The derivation of historical solid waste costs by sector is discussed below. Future costs associated with existing solid waste programs were estimated by linearly extrapolating data on historical costs for each sector. Cost estimates associated with new Federal solid waste regulations were then added to the cost projections for existing solid waste programs. The derivation of costs for new Federal requirements is discussed in Appendix A.

G.1.1. *EPA and Non-EPA Federal Costs*

Estimates of historical EPA solid waste costs were derived from annual "EPA Justification of Appropriation Estimates for Committee on Appropriations" documents. For years 1972 through 1980, expenditures were reported as solid waste costs. Beginning in 1981, however, expenditures for solid waste were not broken out from other RCRA costs. To isolate solid waste expenditures in years after 1980, data on RCRA budgets for individual EPA regions supplied by the EPA Office of Resource Management were used. The regional budgets broke out solid waste costs from larger RCRA costs; we used the average percentage of regional RCRA budgets directed to solid wastes to calculate EPA solid waste costs for years after 1980.

Estimates of historical non-EPA Federal solid waste costs were derived from the Commerce Department pollution abatement cost data base. Since non-EPA Federal costs are not reported in the "Pollution Abatement Control Expenditures" (PACE) reports published in the *Survey of Current Business*, this data was taken directly from the Commerce survey results for each year 1972-1987.

G.1.2. *State and Local Government Costs*

Estimates of local government solid waste expenditures are reported in Tables G-1 through G-3. These were derived from the Commerce *Government Finances* annual reports for years 1972-1987. For years 1985-87, the data source reports solid waste capital and O&M costs at the local level. For previous years, however, the data source did not break out capital and O&M expenditures separately from total solid waste costs. To isolate capital and O&M cost estimates for these years, we applied the 1985-87 average percentages of total costs for capital and O&M costs to the 1972-84 total expenditure data.

State solid waste costs are not reported in the *Government Finances* series. They are believed to be very low since solid waste has traditionally been a local responsibility. No estimates of state costs are provided in this report.

G.1.3. *Private Costs*

Tables G-1 through G-3 also provide estimates of private costs for solid waste. These estimates were derived from the PACE reports.

G.2. DERIVATION OF FEDERALLY MANDATED COSTS

To date, the Federal government has played a very limited role in the solid waste area. The Federal government has been concerned with solid waste since the Solid Waste Act of 1965; however, Federal involvement has been limited to providing guidelines and financial assistance for the development of state solid waste management plans. Historically, there has been little action with regards to state plans at both the state and Federal levels.

The Resource Conservation and Recovery Act of 1976 did not much increase the Federal role. RCRA directed EPA to publish guidelines for solid waste management, including criteria for determining which facilities are sanitary landfills and which are open dumps. A narrow Federal effort was directed to closing open dumps or upgrading them to sanitary landfills. This effort was largely limited to requiring states to publish a list of their identified open dumps, however.

Due to the limited Federal requirements in the solid waste area, few solid waste costs have been pursuant to Federal measures. States incurred some costs for development of management plans, but no data are available on these expenditures. Moreover, it is likely that the publication of listings of open dumps motivated some dump owners to upgrade these facilities to sanitary landfills to avoid local citizen action, but no cost data is available on such compliance measures.

The data on local and private solid waste costs, which together account for the large majority of total solid waste costs, does not distinguish costs pursuant to Federal mandates from total costs. In order to provide an estimate of Federally-driven solid waste costs, we assumed that five percent of local and private costs were motivated by Federal measures in each of the years 1972-1987. Due to the limited Federal role in the solid waste area, it is doubtful that this is an underestimate; it most likely over-estimates Federally-driven costs somewhat. All EPA and non-EPA Federal costs for solid waste were treated as being pursuant to Federal mandates, however.

Table G-1: SOLID WASTE RAW DATA FROM *GOVERNMENT FINANCES & SURVEY OF CURRENT BUSINESS*

(millions of current dollars)

	Source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	AVG
	Local Government																	
1	Total Expend	1,565	1,718	1,915	2,125	2,302	2,336	2,727	2,992	3,322	3,777	4,137	4,364	4,710	5,212	5,834	6,462	
2	Capital	235	258	287	319	345	350	409	449	498	567	621	655	707	717	951	1,059	
3	Operating	1,330	1,460	1,628	1,806	1,957	1,986	2,318	2,543	2,824	3,210	3,516	3,709	4,004	4,495	4,883	5,403	
4	Cap % of Total														0.14	0.16	0.16	0.15
5	O&M % of Total														0.86	0.84	0.84	0.85
	Private																	
6	Capital	273	355	424	414	464	556	599	771	882	966	853	805	1,030	1,239	1,194	1,375	
	Operating																	
7	Abatement	1,838	2,107	2,422	2,646	3,058	3,581	3,905	4,765	5,356	6,238	5,727	6,127	7,158	7,737	8,907	9,985	
8	Res & Dev	12	10	13	21	20	21	16	11	19	18	20	28	29	31	32	35	
9	Total O&M	1,850	2,117	2,435	2,667	3,078	3,602	3,921	4,776	5,375	6,256	5,747	6,155	7,187	7,768	8,939	10,020	

Footnotes for Table G-1

1 Figures from "Sanitation other than sewage" in issues of *Government Finances* series: 1972-1976 data from Table 7; 1977 data from Table 11; 1978-1980 data from Table 10; 1981-1984 data from Table 11; and 1985-1987 data from Table 8

2 Figures for 1972-1984 represent 15% of line 1. 15% represents the average percentage of total expenditures for capital costs for the years 1985-1987.

3 Figures for 1972-1984 represent 85% of line 1. 85% represents the average percentage of total expenditures for operating costs for the years 1985-1987.

4 1985-1987 line 2 divided by line 1. AVG = average of line 4 percentages for 1985-1987

5 1985-1987 line 3 divided by line 1. AVG = average of line 5 percentages for 1985-1987

1972-1982 figures from "Solid Waste" column, *Survey of Current Business*, July 1986
  6 Pollution abatement and control, Pollution Abatement, Business, On capital account, Table 9, Line 7
  7 Pollution abatement and control, Pollution Abatement, Business, On current account, Private, Table 9, Line 9
  8 Pollution abatement and control, Research and development, Private, Table 9, Line 20

1983-1987 figures from "Solid Waste" column, *Survey of Current Business*, June 1989
  6 Pollution abatement and control, Pollution Abatement, Business, On capital account, Table 6, Line 7
  7 Pollution abatement and control, Pollution Abatement, Business, On current account, Private, Table 6, Line 9

8 Pollution abatement and control, Research and development, Private, Table 6, Line 20

9 Sum of lines 7 and 8

Table G-2: SOLID WASTE RAW DATA RECAPITULATED IN TOTALS FOR CAPITAL & OPERATING COSTS

(millions of current dollars)

	Source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
	Local Government																
1	Capital	235	258	287	319	345	350	409	449	498	567	621	655	707	717	951	1,059
2	Operating	1,330	1,460	1,628	1,806	1,957	1,986	2,318	2,543	2,824	3,210	3,516	3,709	4,004	4,495	4,883	5,403
	Private																
3	Capital	273	355	424	414	464	556	599	771	882	966	853	805	1,030	1,239	1,194	1,375
4	Operating	1,850	2,117	2,435	2,667	3,078	3,602	3,921	4,776	5,375	6,256	5,747	6,155	7,187	7,768	8,939	10,020
	Fixed-weighted price indexes																
5	Government	0.386	0.418	0.461	0.494	0.524	0.553	0.583	0.639	0.687	0.782	0.840	0.882	0.924	0.959	1.000	1.040
6	SW Bus Cap	0.373	0.390	0.432	0.489	0.523	0.568	0.622	0.684	0.762	0.848	0.907	0.947	0.968	0.970	1.000	1.053
7	SW Bus O&M	0.388	0.420	0.466	0.495	0.525	0.552	0.579	0.635	0.681	0.778	0.835	0.876	0.920	0.957	1.000	1.037

Footnotes for Table G-2

1 Recapitulation of Line 2, Table G-1
2 Recapitulation of Line 3, Table G-1
3 Recapitulation of Line 6, Table G-1
4 Recapitulation of Line 9, Table G-1

Lines 5, 6, and 7: Selected fixed-weighted price indexes (1982), *Survey of Current Business*, converted to 1986 index.

1972-1982 indexes taken from July, 1986 issue
1983-1987 indexes taken from June, 1989 issue

Table G-3: SOLID WASTE RAW DATA CONVERTED FROM CURRENT DOLLARS INTO 1986 DOLLARS

(millions of 1986 dollars)

	Source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
	Local Government																
1	Capital	609	617	623	645	659	634	701	702	725	724	738	743	764	748	951	1,018
2	Operating	3,449	3,496	3,528	3,656	3,732	3,591	3,975	3,977	4,108	4,104	4,185	4,208	4,331	4,688	4,883	5,194
	Private																
3	Capital	733	911	980	847	887	980	963	1,126	1,157	1,140	941	850	1,064	1,277	1,194	1,305
4	Operating	4,766	5,042	5,228	5,388	5,862	6,528	6,769	7,519	7,891	8,042	6,885	7,029	7,813	8,113	8,939	9,665

Footnotes for Table G-3

1 Line 1, Table G-2, divided by line 5, Table G-2

2 Line 2, Table G-2, divided by line 5, Table G-2

3 Line 3, Table G-2, divided by line 6, Table G-2

4 Line 4, Table G-2, divided by line 7, Table G-2

Table G-4: CONVERSION OF LOCAL GOVERNMENT SOLID WASTE FISCAL YEAR TO CALENDAR YEAR FIGURES

(millions of 1986 dollars)

	Source	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
	Local Government																
1	Capital	613	620	634	652	646	668	702	713	725	731	741	753	756	849	984	1,018
2	Operating	3,473	3,512	3,592	3,694	3,661	3,783	3,976	4,042	4,106	4,144	4,196	4,270	4,510	4,786	5,038	5,194
	Private																
3	Capital	733	911	980	847	887	980	963	1,126	1,157	1,140	941	850	1,064	1,277	1,194	1,305
4	Operating	4,766	5,042	5,228	5,388	5,862	6,528	6,769	7,519	7,891	8,042	6,885	7,029	7,813	8,113	8,939	9,665

Footnotes for Table G-4

1972 calendar year expenditure equals average of 1972 and 1973 fiscal year figures from Table G-3. The same holds true for all years except 1987, which is the 1987 figure from Table G-3.

Table G-5: DISTRIBUTION OF EPA HAZARDOUS WASTE AND SOLID WASTE, 1981-1990

(millions of current dollars)

Source	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
1 EPA Reported Hazardous Waste	157	124	127	135	151	205	252	258	254	263	307
2 Subtitle D Percent	9.40%	0.00%	0.00%	0.00%	1.35%	1.44%	1.40%	2.70%	4.10%	5.57%	5.72%
3 Subtitle D Dollars	15	0	0	0	2	3	4	7	10	15	18
4 Hazardous Waste	142	124	127	135	149	202	248	251	243	249	290

Footnotes for Table G-5

1 From annual EPA Justification of Appropriation Estimates for Committee on Appropriations

2 From EPA Office of the Controller

3 Line 1 multiplied by Line 2

4 Line 1 minus Line 3

Table G-6: DISTRIBUTION OF EPA HAZARDOUS WASTE AND SOLID WASTE, 1981-1990

(millions of 1986 dollars)

Source	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
1 EPA Reported Hazardous Waste	201	147	144	146	157	205	242	237	223	223	250
2 Subtitle D Dollars	19	0	0	0	2	3	3	6	9	12	14
3 Hazardous Waste	182	147	144	146	155	202	239	231	214	210	236
4 Fixed-weighted price indexes	0.782	0.840	0.882	0.924	0.959	1.000	1.040	1.090	1.136	1.182	1.228

Footnotes for Table G-6

1 Line 1, Table G-5, divided by Line 4, Table G-6

2 Line 2, Table G-5, divided by Line 4, Table G-6

3 Line 3, Table G-5, divided by Line 4, Table G-6

4 Fixed-weighted price indexes described in Chapter 1

Table G-7: ADJUSTMENT OF PRIVATE MANUFACTURING HAZARD WASTE TO REMOVE DEPRECIATION

(millions of current dollars)

Source	1983	1984	1985	1986
1 Hazardous Waste Operating Cost	574	770	943	1,136
2 Total pollution abatement operating cost	9,078	10,003	10,676	11,108
3 Total pollution abatement depreciation	1,696	1,903	2,044	2,030
4 Millions of current dollars	466	624	762	928
5 Fixed-weighted price indexes	0.876	0.920	0.957	1.000
6 Millions of 1986 dollars	533	678	796	928

Footnotes for Table G-7

1 Table 4a, Operating costs by form of pollutants abated, Solid waste, Hazardous, All Industries
2 Table 4a, Operating costs by form of pollutants abated, Total, All Industries
3 Table 5a, Operating cost, By kind of cost, Depreciation, All Industries
4 Line 1 minus ((Line 1/Line 2) X Line 3)
5 Fixed-weighted price indexes described in Chapter 1
6 Line 4 divided by line 5

APPENDIX H
ESTIMATION OF SUPERFUND, UST, AND FEDERAL HAZARDOUS WASTE COMPLIANCE COSTS

This appendix provides background information on the data sources, assumptions, and derivations used to develop the cost estimates for the Superfund remediation program, the underground storage tank (UST) technical standards and financial responsibility rules, and non-EPA Federal facility RCRA- and Superfund-related compliance activities. The cost estimates for these programs are presented in Chapter 5.

H.1. SUPERFUND COSTS

H.1.1. *EPA Costs*

The estimates of historical EPA expenditures for Superfund activities are based on actual budget obligations from the CERCLA Trust Fund (the Fund) for years 1981-1989, and estimated obligations for year 1990, as reported by the EPA Office of Emergency and Remedial Response (OERR).[1] Estimates of future EPA costs are based on straight line extrapolation of historical capital and operation and maintenance (O&M) costs using simple regression models.

Estimates of EPA capital costs include Fund obligations for all response activities except those relating to remedial action O&M. These include costs for: 1) remedial investigation and feasibility studies; 2) remedial design studies; 3) remedial actions; 4) other response actions such as preliminary site evaluations, and; 5) removal actions.

Estimates of EPA O&M costs include Fund obligations for: 1) research and development; 2) enforcement; 3) management and support; 4) assistance to other Federal agencies; and 5) remedial action O&M activities.

H.1.2. *Private Costs*

Estimates of private sector costs for investigation and cleanup activities were derived using unit cost and level of activity data from: 1) two recent EPA reports to Congress on the progress of the Superfund program (hereafter referred to as the "1989 Progress Report" and the "1990 Progress Report");[2] 2) the Regulatory Impact Analysis for proposed revisions to the National

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[1] "Superfund Obligations History Chart" supplied by the Office of Program Evaluation, EPA Office of Emergency and Remedial Response.

[2] (a) US EPA, *Progress Toward Implementing Superfund Fiscal Year 1987: Report to Congress*, Office of Solid Waste and Emergency Response, EPA 540/8-89/003, April 1989; and (b) US EPA, *Progress Toward Implementing Superfund Fiscal Year 1989: Report to Congress*, Office and Emergency and Remedial Response, March 1990.

Contingency Plan published in 1989 (hereafter referred to as "NCP RIA")[3]; and 3) activity pricing factors reported by OERR. The various steps used to calculate private costs, including the various assumptions and projection techniques employed are outlined below.

In the first step, unit cost estimates were identified for the following activities: removals, remedial investigation and feasibility studies (RIs), remedial design studies (RDs), and remedial actions (RAs). For removals, a unit cost estimate of $.525 million was used. This estimate represents the current average cost for this activity as reported by OERR. For both RIs and RDs, a unit cost estimate of $.750 million reported by OERR was used.

The unit cost estimates for RAs vary each year according to the mix of containment versus treatment remedies utilized in that year. The following average capital and O&M unit costs associated with containment and treatment remedies were obtained from the NCP RIA (p. 2-11):

Remedy	Capital Cost	Operating Cost
Containment	$ 4.483 M	.612 M
Treatment	17.237 M	.340 M

These unit costs were multiplied by estimates of the distribution of treatment (which includes non-source controls) versus containment remedies associated with RAs conducted in past years and expected for future RAs to derive average unit RA capital and O&M costs for each of the years 1982-2000. The actual distributions of RAs using treatment and containment remedies for the years 1982-1987 were obtained from the 1989 Progress Report (p. 41); the expected distributions for years after 1987 were taken from the NCP RIA (p. 3-4). They are:

Year	Containment	Treatment
1982-84	57%	43%
1985	61%	39%
1986	39%	61%
1987	25%	75%
1988-2000	20%	80%

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[3] US EPA, *Regulatory Impact Analysis in Support of the Proposed Revisions to the National Oil and Hazardous Substances Pollution Contingency Plan*, Prepared by ICF, Inc., September 1988.

Multiplying the above distributions for each year by the unit capital and O&M costs produces the following weighted average estimates of RA capital and O&M costs which were used for the RA cost derivations:[4]

Year	Capital Cost	Operating Cost
1982-84	$ 9.967 M	$ .495 M
1985	9.457 M	.506 M
1986	12.263 M	.446 M
1987	14.049 M	.408 M
1988-2000	14.686 M	.394 M

In the second step, actual activity levels over past years for removals, RIs, RDs, and RAs by Potentially Responsible Parties (PRP-led) were obtained from the EPA progress reports and used to predict future activity levels. Activity data for years 1981-1987 came from the 1989 Progress Report (pp. 22, 36, and 43); data for 1988 and 1989 came from the 1990 Progress Report (pp. 6, 20). The activity data for years 1981-1989 were then applied in simple regression models to predict PRP-led investigation, removals, and remediation activities for years 1988-2000. For example, actual levels of PRP-led removals over years 1981-1987 were regressed against time. The resulting parameter estimates were then multiplied by each of the years 1990-2000 to estimate the number of PRP-led removals for these years. (The projections for PRP-led removals, RIs, RDs, and RAs for each of the years 1990-2000 are given in Table H-1.)

In the third step, the actual and predicted activity levels were multiplied by the relevant unit costs to estimate total costs PRPs for each activity over the years 1981-2000. The activity data for RIs, RDs, and RAs for any year represent first starts in that year. Historically, these activities last well beyond one year. For simplicity in the calculation of annual costs, however, first starts in any year are treated as being completed in that year. This is consistent with the Fund budget obligations data used to derive EPA costs.

In the final step, the various capital and annual costs to the private sector associated with the four activities were summed to find the total capital and annual costs to each sector for the years 1981-2000. Investigation and design costs, removal costs, and RA capital costs were summed to find total capital costs over each year of the estimation period. Private O&M costs are for remedial action O&M activities.

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[4] The estimates for years 1988-2000 correspond to the current $15 million average remedial action capital cost reported by the 1990 Progress Report (p. 11).

H.1.3. *State Costs*

Estimates of state capital costs for Superfund remediation are based on estimates of historical and projected future EPA capital costs. State capital costs arise because under CERCLA and SARA states are required to assume ten percent of Fund-led RA capital costs. Estimates of state capital costs were derived by assuming that estimated EPA capital costs represent 90 percent of total governmental capital costs, and state costs the remainder.

The law also required that states assume ten percent of first-year O&M costs associated with Fund-led remedial actions, and 100 percent of O&M costs in subsequent years.[5] Estimates of Fund-led RA O&M costs were derived by multiplying estimates of actual and projected future Fund-led remedial actions by an estimated unit cost for this activity. The estimates of historical and predicted future levels of Fund-led remedial actions are presented in Table H-1. The state share of total Fund-led O&M costs were derived using the cost allocation formula stated above.

H.1.4. *Non-EPA Federal Costs*

The Superfund costs for non-EPA federal agencies presented in Chapter 5 represent the estimated combined expenditures by the U.S. Department of Energy and the U.S. Department of Defense for Superfund investigation and clean-up activities. These two agencies account for the large majority of non-EPA Federal compliance expenditures pursuant to Superfund. The derivation of these estimates is discussed in Section H.4.

H.2. UST TECHNICAL STANDARDS

The incremental capital and O&M costs for this recently promulgated rule were derived using discounted per-tank costs and timing information provided by the 1988 Regulatory Impact Analysis for UST technical standards[6] (hereafter referred to as "Technical RIA"). Costs for the rule were apportioned over time based on requirements set by the rule and assumptions made by the Technical RIA. In all cases, the discounting factor based on 3 percent over 30 years was eliminated to show nominal (i:e. undiscounted) costs. The resulting per-tank costs were then used to find total industry and municipal costs for the estimated population of 1.717 million tanks[7] affected by the rule.

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[5] SARA amended CERCLA to provide that the costs of restoring ground and surface waters to levels protective of human health are to be treated as part of the costs of remedial action and not as an O&M cost allocable to states. As a result, states are only responsible for 10 percent of such costs as opposed to 100 percent if they were considered O&M costs. In our cost calculations, however, we attributed all post first-year O&M costs to states.

[6] ICF Inc., *Regulatory Impact Analysis of Technical Stqndards for Underground Storage Tanks: Volume 1*, Prepared for the US EPA Office of Underground Storage Tanks, August 1988.

The final rule, which went into effect in 1989, requires UST replacement/upgrade to meet new tank integrity standards, the institution of release detection monitoring UST systems, and periodic tank tightness testing. The derivation of capital costs for these requirements are discussed below. There are two components of capital costs: tank, pipe, and component replacement, and installation of leak detection equipment.

In order to estimate the incremental costs of the rule for replacement/upgrade of tanks, pipes, and components, we subtracted the base case per-tank replacement costs shown in Exhibit 4-2 (p. 4-4) from the final rule per-tank replacement costs shown in Exhibit 4-5 (p. 4-10). The total net discounted replacement cost per tank was estimated as $6207. The rule requires replacement/upgrade of tanks and components by the tenth year after the regulation goes into effect (i.e. 1998) unless component failure occurs prior to that time. Failure rates for each year prior to year 10 were derived using estimates in Exhibit 7-2 (p. 7-5), showing probabilities of high- and low-cost release events and the probability of tank replacement or repair because of a release event. The probability that replacement would be necessary was derived by adding the probabilities of high- and low-cost events and multiplying this by the probability that tank replacement would be necessary if a release event occurred. During the first 5 years that the rule is in effect, a failure rate of 2.8 percent was estimated; during the following 4 years, a rate of 1.14 percent was estimated. The sum of probabilities for years 1 through 9 were subtracted from 100 to estimate the probability that tank replacement would not be required until year 10; the estimated percentage of tanks that would be replaced in year ten was therefore 81.44 percent.[8] These probabilities were used to apportion tank replacement/ upgrade costs over the first ten years of the period.

Leak detection is required to be phased in over the first five years of the rule based on the age of tanks. The Technical RIA assumes that half of all tanks will be fitted with observation wells, while the other half will opt for annual tank testing until replacement or upgrade, with observation wells required ten years thereafter. Costs for installation of observation wells were therefore divided in half: one half was distributed over the first five years during which wells would be installed according to tank age, and the other half applied in year 20 when the remaining tanks will be required to have wells installed. The number of tanks required to be replaced over the 5-year phase-in period was derived using Exhibit 2-1 (p. 2-8) showing age distributions of steel- and fiberglass- reinforced tanks. Age distributions for each type of tank were multiplied by the percentage of the total population for each given in Exhibit 2-7 (p. 2-26). For instance, tanks between 15 and 20 years of age need to be replaced in year 3 or to commence annual monitoring. Steel tanks are the only tanks of this age and comprise 24 percent of the steel tank population, which in turn comprise 89 percent of the total tank population. Because the RIA assumes only half of such tanks will elect to have leak equipment installed, the percentage of tanks incurring such costs in year 3 will be (24 percent) x (89 percent) x (50 percent) = 10.68 percent. For tanks less than 15 years old, percentages for steel tanks and for fiberglass-reinforced tanks are each calculated in this manner and then summed. Thus, total capital costs for leak detection are apportioned among years 1 through 5 (when half of the tank population will have observation wells installed) and year 20 (when the remaining half of the tank population will have wells installed). The total capital costs were taken from the Technical RIA's discounted per-tank costs for leak detection equipment, shown in Exhibit 4-5 (p. 4-10) at a net discounted cost of $1091. For the sake of simplicity, the yearly distributions do not include estimates of component failure and replacement prior to year 10. (Note that the Technical RIA estimates 36 percent of steel tanks are 20 years or older. Since the rule requires tanks 25 years and older or of unknown age to be tested during the first year, we needed to estimate what portion of the 36 percent represented the oldest age category. Richard Braddock of EPA estimated that 60 percent of the 36 percent were tanks 25 years or older, and 40 percent were between 20 and 25 years old.

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[7] It should be noted that the UST population estimate is probably too high, resulting in an upward bias in our cost estimate. The assumption of constant UST population used in the RIA's cost analysis is inconsistent with the same RIA's Economic Impact Analysis, which predicts a significant decline in the number of small petroleum retal outlets due to the impact of the rule. Recent evidence has shown that this is indeed the case: on net, the UST poulation has been declining in recent years at an annual rate of 2-4 percent.

[8] In recent years, tank replacement has run about 4-6 percent annually. This suggests that by the year 1997, fewer than 81 percent of the UST population will need to be upgraded or replaced--perhaps closer to 60 percent. In addition to replacements due to failure, many tanks are being replaced voluntarily or in response to state requirements. Thus, year 10 (1997) replacement costs should be lower than our estimated costs, but early tank replacement should result in higher costs over the first nine years of the program than given by our estimates.

Annual O&M costs for underground storage tanks have four components: (1) annual tank and pipe testing; (2) annual line leak testing; (3) annual observation well monitoring; and (4) annual cathode protection testing.

Annual tank and pipe testing may be used as a means of leak detection for tanks. As discussed above, the other alternative for leak detection is installation of leak detection equipment, or observation wells. Following the Technical RIA's assumption that half of the tank population will be fitted with equipment and the other half tested annually, we derived annual tank and pipe testing costs in the following manner.

Because leak detection requirements are based on tank age, tank and pipe testing is phased in over the first five years at the same rate as that calculated above for installation of observation wells. Annual testing costs differ from equipment costs because they are cumulative. For example, in year three, equipment costs are incurred by 10.68 percent of the tank population. By contrast, testing costs in year three are incurred by 26.7 percent of the tank population: 10.68 percent representing tanks for which testing is begun in year three, 6.23 percent representing tanks for which testing began in year two, and 9.79 percent representing tanks for which testing began in year one. By year five testing is done for half of the tank population, which continue to be tested until year 10, when all tanks must be replaced or upgraded. Five years after replacement/upgrade, tanks are required to be tested again. The discounted per-tank cost of annual tank and pipe testing is shown in Exhibit 4-4 as $2161. Because the costs are cumulative, the sum of the percentages equal more than 50 percent; thus the percentages could not be applied directly to apportion the total cost. Instead the costs are distributed proportionally based on each year's portion of the sum of all percentages. This new group of percentages was used to apportion the total per-tank testing costs.

Annual line leak testing must be in place by year two. Testing costs are assumed to begin in year three for all tanks. The net per-tank cost of line leak testing is obtained by subtracting the base case cost shown in Exhibit 4-1 (p. 4-3) from the rule's cost shown in Exhibit 4-4 (p. 4-8). Because the Technical RIA calculates costs over a 30-year period, the cost of line leak testing is distributed evenly among years three through 30.

Annual per-tank observation well monitoring costs are shown in Exhibit 4-4 of the Technical RIA. Costs are incremented during the first 5 years as 50 percent of the tank population are fitted with wells and monitoring begins. From years 5 through 20 costs are constant as all tanks within this 50 percent are monitored annually. In year 20 the remaining 50 percent of tanks that had opted for annual tank testing are required to have observation wells installed, and so from years 21 through 30, 100 percent of the tank population must be monitored. The annual monitoring cost were therefore apportioned according to each year's portion of the sum of all percentages.

Annual cathode protection testing for existing tanks is required for tank upgrades. The timing of testing costs relates to two factors—the age of tanks, which determines when they will be subject to the rule, and the type of cathodic system installed. Cathodic protection systems must be tested within 6 months of installation and every three years thereafter; impressed current cathodic systems must be inspected every 60 days; and owners and operators must maintain records to demonstrate compliance. In view of the unknown variability of these costs, average costs were assumed to occur on an annual basis. The phase-in of tanks subject to testing follows the schedule for tank and pipe replacement discussed earlier. The estimated rates of tank failure and replacement are, as noted previously, estimated at 2.8 percent during the first 5 years; testing these new or upgraded tanks which must be cathodically protected would therefore occur during years 2 through 6, with the total number incremented yearly as new tanks become subject to the rule. During years 6 through 10, an estimated 1.14 percent of tanks will fail and be replaced, requiring these tanks to be tested as well. In year 10 (1998) the remaining tanks will be upgraded or replaced, resulting in 100 percent of the tank population being tested from year 11 through 30. The total cost for cathodic protection testing is distributed proportionally over 30 years based on each year's portion of the sum of percentages of tanks affected for the 30-year period.

The technical standards rule also requires UST owners and operators to perform corrective action for leaking UST systems. Corrective action costs for years 1 through 10 were derived using the RIA estimates of corrective action probabilities and costs associated for high- and low-cost release events given in Exhibit 7-2 (p. 7-5). The cost of corrective action for a release event is multiplied by the probability of an event occurring, which is then multiplied by the number of tanks. The result is an estimate of per-tank corrective action costs. These costs were calculated for high- and low-cost release events occurring each year. Estimates of high- and low-cost events were then added to produce an estimate of annual corrective action costs, which change at five year intervals. Due to the required replacement of the oldest tanks during the first five years of the rule, estimated discounted per-tank corrective action costs decline from $3,419 per year for years one through five to $659 for years six through ten.

The Technical RIA did not provide any information concerning how much of corrective action costs are capital costs and how much are O&M costs. To break down corrective action costs in this way, we assumed that 85 percent of total costs would be capital costs, and the remainder O&M costs.

In the last step, capital costs for tank replacement/upgrade, leak detection equipment, and corrective action were summed for each year over the period 1989-2000. The same was done for the various O&M cost components. Costs were allocated to the private sector and the local government sector (which also includes state governments) based on the estimated share of total UST systems owned by these sectors. UST costs were not calculated for non-EPA federal facilities because such costs are included in the larger category of Federal facility RCRA costs discussed in Section H.4, which could not be separated out.

H.3. UST FINANCIAL RESPONSIBILITY REQUIREMENTS

The Regulatory Impact Analysis for the Petroleum-containing UST financial responsibility rule of 1988[9] (hereafter referred to as "Financial RIA") presents discounted costs for the rule concerning UST financial responsibility requirements. The distribution of annual costs discussed in this section is based on the RIA estimates of costs that are incremental to those imposed by the UST technical standards rule. Discounting factors are "backed out" for all costs shown in the RIA for purposes of this study. Because the Financial RIA focuses on costs to retail motor fuel marketers, the costs presented in the study reflect the same emphasis. Also, the rule affects private and municipal UST systems only. Five percent of total estimated costs for the rule were allocated to municipalities, and the remainder to the private sector based on the proportion of UST systems owned by each of these sectors.

The incremental discounted cost per tank for tank replacement, upgrading, and leak detection is shown in Exhibit 4-6 (p. 4-14) as a single figure: $911. Because capital and annual costs are not distinguished within this amount, we applied the same proportional relationship that existed between total discounted incremental capital and annual costs in the RIA for technical standards: capital costs of $7,298 and O&M costs of $2,674 per tank. The result is an estimated discounted capital cost per tank of $665 and a discounted annual cost per tank of $246.

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[9] US EPA, *Regulatory Impact Analysis for Financial Responsibility Requirements for Petroleum Underground Storage Tanks*, Office of Underground Storage Tanks, October 1988.

The capital cost is assumed to occur in year two because the rule requires all owners or operators of USTs must demonstrate evidence of financial responsibility within 21 months of the rule's effective date. The rule requires petroleum marketing firms owning 100 or more USTs to show evidence of financial responsibility within 9 months of the effective date. The rule also requires non-petroleum marketing firms with tangible net worth of more than $20 million to show evidence of financial responsibility by the effective date of the rule. Exhibit 3-1 (p. 3-3) was used to estimate the percentage of USTs owned by firms that fall into these categories. Using the EPA's estimated average of 4.1 USTs per retail motor fuel outlet and the number of outlets per firm given in Exhibit 3-1 (p.3-3), we obtained an estimate of the average number of USTs per firm for each category of firm size in Exhibit 3-1. The results showed that approximately 0.2 percent of firms owned 100 or more USTs and are therefore subject to the earliest compliance dates; these firms own approximately 33 percent of USTs within the retail motor fuel marketing sector. Firms owning less than 100 USTs constitute 99.8 percent of the sector and own approximately 67 percent of USTs.

The cost to firms resulting from financial responsibility requirements are tied to firms' ability to obtain liability insurance. The RIA assumes that firms estimated to own 100 or fewer USTs are assigned an aggregate liability limit of $1 million, while all other firms are assigned an aggregate liability limit of $2 million (p. A-15). The RIA also assumes that any firm with a net worth ten times its assigned aggregate is assumed to use the financial test and/or to guarantee its subsidiaries (p. A-15). For firms for which assets-by-net-worth data are available, it was assumed that net worth would constitute 50 percent of the firm's assets (p. A-15). These assumptions were applied to estimate the percentage of firms that would use the financial test, based on the distribution of total assets among firms owning retail motor fuel outlets shown in Exhibit 3-3. The exhibit shows the number of firms and the number of outlets owned by firms according to total asset amounts. Based on the RIA's assumptions stated above, firms owning more than 100 USTs must have a net worth of at least $20 million in order to use the financial test. Assuming that new worth amounts to 50 percent of total assets, firms in the three highest asset categories appear to coincide with firms that face the early compliance dates because each owns approximately the 33 percent of USTs in the retail petroleum marketing sector. (The estimate of firms using the financial test is approximate because the third category of net worth ranges from $5 million to $50 million.) Therefore, for the purposes of this analysis it was assumed that firms owning 33 percent of USTs would be able to self-insure.

It was assumed that 67 percent of USTs within the retail petroleum marketing sector and in other sectors would need to be covered by an outside form of insurance. According to the Financial RIA, all USTs within the agriculture and local government sectors will need to seek insurance coverage. For the purposes of this analysis it was assumed that these firms would be able to self insure.

H.4. FEDERAL FACILITY HAZARDOUS WASTE COSTS

Reliable estimates of future Federal facility compliance costs pursuant to RCRA and CERCLA are unavailable at this time given the uncertainty over the magnitude of Federal corrective action and remediation needs. However, estimates of non-EPA Federal hazardous waste-related compliance costs were calculated using recent years' budget appropriations data and estimates of future budget needs in this area for the two most important Federal players—the Department of Energy (DOE) and the Department of Defense (DOD). These agencies are discussed separately below and the costs shown in Table H-2.

H.4.1. *Department of Energy Costs*

Data on actual DOE budget appropriations associated with hazardous waste and Superfund activities for years 1989 and 1990, and estimated budgets for years 1991-1996 were obtained and used to derive DOE cost estimates for these years.[10] DOE costs in subsequent years are assumed to remain at year 1996 levels.

DOE budget expenditures reported for "Environmental Restoration" are used to represent Superfund costs. DOE defines these as costs for "cleanup of inactive hazardous and radioactive waste sites at all DOE facilities and some non-DOE sites for which DOE has some responsibility". DOE budget estimates for "Waste Operations" are used to represent hazardous waste costs. DOE reports that this category of costs involves all compliance activities relating to the treatment, storage, and disposal of hazardous wastes. DOE also reports costs for "Corrective Activities". These costs represent compliance activities pursuant to a variety of environmental laws, and were not used for this analysis.

H.4.2. *Department of Defense Costs*

Historical costs for the DOD were derived from a 1988 agency report on its environmental restoration program.[11] DOD costs for years 1990-1991 are based on actual and estimated budget appropriations reported by the Congressional Budget Office.[12] The DOD source reports costs for years 1984-1986 for two categories of activities: "Installation Restoration Program (IRP)" and "Hazardous Waste Disposal" (HWD). DOD defines IRP costs as those to "identify, investigate, and cleanup contamination from hazardous substances and wastes on installations and at formerly used properties". We used costs for this program to represent Superfund costs; costs for HWD were used to represent RCRA costs. To estimate that portion of total DOD costs directed to HWD in years 1987-1991, which are not reported in the data source, we assumed that they were 25 percent of reported IRP costs. This represents the average percentage of total DOD costs for HWD reported for years 1984-1986.

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[10] The data for DOE actual FY 1989 and 1990 appropriations were obtained from a March 1990 unpublished Draft Report by the Congressional Budget Office entitled "Federal Facility Hazardous Waste Liabilities". The estimates of budget needs for years 1991-1996 were obtained from: US Department of Energy, *Environmental Restoration and Waste Management: Five Year Plan, 1992-1996*, June 1990.

[11] U.S. Department of Defense, *Defense Environmental Restoration Program: Annual Report to Congress FY 1987*, March 1, 1988.

[12] See footnote 10.

No information on DOD costs for years after 1991 are available. To estimate DOD costs for these years, we assumed that total costs in future years would increase at the same annual rate shown by our estimates of DOE costs in future years. We then assumed that 75 percent of total DOD costs projections for future years would be for Superfund activities, and the remainder for RCRA activities, which corresponds to the DOD cost allocations in previous years.

H.4.3. *Total Federal Facility Costs*

For each of the years 1989-2000, the estimates of DOE and DOD Superfund costs were combined to show Federal facility costs for this program. The same was done for DOD and DOE costs for hazardous waste operations to show total Federal facility costs for associated with RCRA.

A further adjustment to the Federal facility costs estimates was performed to break them into capital and O&M cost components. Since no information was available on the components of Federal facility costs, it was assumed that 85 percent of compliance costs are capital costs, and the remainder O&M costs. These capital and operating costs are shown in Table H-2 as well as in Tables 5-1 and 5-2 of Chapter 5.

Table H-1: ACTUAL AND PROJECTED LEVELS OF SUPERFUND INVESTIGATION AND REMEDIATION ACTIVITIES, YEARS 1980-2000

	Level of Activity[2]							
	Fund-Led[3]				PRP-Led[4]			
Year	Rem	RI	RD	RA	Rem	RI	RD	RA
1980	7	0	0	0	0	0	0	0
1981	28	21	5	0	0	0	0	0
1982	60	32	4	9	1	3	0	0
1983	129	112	7	9	10	11	5	2
1984	208	127	16	16	62	28	5	9
1985	196	129	19	8	86	59	10	7
1986	175	37	26	12	58	46	19	9
1987	254	127	70	35	50	56	24	19
1988	220	93	69	51	108	57	30	21
1989	236	70	63	57	86	87	94	51
1990	304	117	71	65	103	84	71	52
1991	331	121	81	72	115	95	83	58
1992	358	127	90	79	127	106	95	65
1993	386	132	99	86	139	116	107	71
1994	413	137	109	94	151	127	118	78
1995	440	143	118	101	164	137	130	84
1996	467	148	128	108	176	148	142	91
1997	495	153	137	115	188	158	159	97
1998	522	159	146	122	200	169	166	104
1999	549	164	156	130	212	180	178	110
2000	577	169	165	137	224	190	189	117

[1] Data for the years 1980-1989 represent historical activity levels. Data for years 1990-2000 are projections based on straight-line extrapolation from actual levels.

[2] The data represent first starts for the following activities:

Rem: Removals
RI: Remedial Investigation and Feasibility Studies
RD: Remedial Design Studies
RA: Remedial Actions

[3] Activities inititated by EPA and funded through the Superfund.

[4] Activities initiated and paid for by Potentially Responsible Parties.

Sources:

1. Data for years 1980-1987 were taken from: US EPA, *Progress Toward Implementing Superfund FY 1987: Report to Congress*, Office of Solid Waste and Emergency Response, April 1989.

2. Data for years 1989-90 were taken from: US EPA, *Progress Toward Implementing Superfund Superfund FY 1989: Report to Congress*, Office of Emergency and Remedial Response, March 1990.

Table H-2: COST ESTIMATES FOR FEDERAL FACILITY COMPLIANCE WITH RCRA AND CERCLA

(millions of 1986 dollars)

Source	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Hazardous Waste Costs																	
Department of Energy[1]	NA	NA	NA	NA	NA	905	1,142	1,504	3,253	3,380	3,642	3,261	3,113	3,113	3,113	3,113	3,113
Department of Defense[2]	24	40	61	81	89	113	130	177	324	375	390	403	381	381	381	381	381
Total Hzrd Waste Costs	24	40	61	81	89	1,018	1,272	1,681	3,577	3,755	4,032	3,664	3,494	3,494	3,494	3,494	3,494
Superfund Costs																	
Department of Energy[1]	NA	NA	NA	NA	NA	491	620	824	1,506	1,743	1,813	1,873	1,769	1,769	1,769	1,769	1,769
Department of Defense[2]	91	186	246	325	353	451	521	708	1,295	1,499	1,560	1,612	1,522	1,522	1,522	1,522	1,522
Total Superfund Costs	91	186	246	325	353	942	1,141	1,532	2,801	3,242	3,373	3,485	3,291	3,291	3,291	3,291	3,291
Capital Costs[3]																	
Hazardous Waste	20	34	52	69	76	865	1,081	1,429	3,040	3,192	3,427	3,114	2,970	2,970	2,970	2,970	2,970
Superfund	77	158	209	276	300	801	970	1,302	2,381	2,756	2,876	2,962	2,797	2,797	2,797	2,797	2,797
Operating Costs[3]																	
Hazardous Waste	4	6	9	12	13	153	191	252	537	563	605	550	524	524	524	524	524
Superfund	14	28	37	49	53	131	171	230	420	486	506	523	494	494	494	494	494

Footnotes to Table H-2

[1] Department of Energy (DOE), hazardous waste and Superfund costs for years 1989 and 1990 are based on actual budget appropriations data obtained from a March 1990 unpublished draft report by the Congressional Budget Office entitled "Federal Facility Hazardous Waste Liabilities". The estimates for years 1991-1996 are based on estimated budget needs for these years reported in: US Department of Energy, *Environmental Restoration and Waste Management: Five Year Plan, 1992-1996*, June 1990. The reported DOE estimates for "Waste Operations" were used to represent hazardous waste costs, and the reported estimates for "Environmental Restoration" were used to represent CERCLA costs. It was assumed that costs in years 1997-2000 would remain at year 1996 levels.

[2] Department of Defense (DOD) hazardous waste and Superfund costs for years 1984-1988 were obtained from: US Department of Defense, *Defense Environmental Restoration Program: Annual Report to Congress FY 1987*, March 1, 1988. The reported DOD costs for "Hazardous Waste Disposal" (HWD) were used to represent RCRA costs, and reported costs for the "Installation Restoration Program" (IRP) were used to represent Superfund costs. DOD costs for years 1990-1991 are based on actual and estimated budget appropriations reported by the Congressional Budget Office (see footnote 1 above). To estimate that portion of total DOD costs directed to HWD in years 1987-1991, which were not reported by the data sources, it was assumed that they were 25 percent of reported IRP costs; this represents the average percentage of total DOD costs for HWD reported for years 1984-1986. No information on DOD costs for years after 1991 are available. To estimate DOD costs

for these years, we assumed that total costs in future years would increase at the same annual rate shown by our estimates of DOE costs in future years. It was assumed that 75 percent of total DOD costs projections for future years would be for Superfund activities, and the remainder for RCRA activities, which corresponds to the DOD cost allocations in previous years.

[3] To disaggregate total costs into capital and O&M cost components, it was assumed that 85 percent of total costs are capital costs and the remainder O&M costs, reflecting a rule-of-thumb commonly applied in the analysis of hazardous waste corrective action programs.

APPENDIX I
ESTIMATION OF TOXIC SUBSTANCES CONTROL COSTS

This appendix contains background data and documentation for the toxic substances control costs presented in Chapter 6. Table I-1 contains private capital costs, annualized capital costs, O&M costs, and total annual costs associated with existing chemical regulation pursuant to TSCA Section 6. All of the capital costs and most of the O&M costs are for three PCB regulations. The O&M costs also reflect certain information provision requirements for existing chemicals.

Tables I-2 and I-3 contain data for costs to the private sector and EPA associated with new chemical regulation. The EPA cost estimates are associated with TSCA Section 5 only; they are thus less than the total EPA cost estimates presented in Chapter 6. All new chemical regulation costs reflect annual costs only (capital costs are insignificant). Data for the years 1979-1988 were estimated by EPA staff; the annual cost estimates for years 1990-2000 are based on linear projections of historical costs. The data presented in Tables I-1 through I-3 are summarized in Table I-4.

Table I-1: INDUSTRY COST OF EXISTING CHEMICAL REGULATION PURSUANT TO TSCA SECTIONS 4, 6, 8 & 12

(millions of 1986 dollars)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Capital (a)	19.50	0.00	0.00	0.00	42.94	23.09	121.22	119.73	116.98	114.13	109.74	89.29
Annual												
Capital (b)	1.84	1.84	1.84	1.84	5.89	8.07	19.52	30.82	41.86	52.63	62.99	71.42
O & M (c)	85.44	102.13	74.85	70.17	71.75	64.91	60.48	62.56	54.58	53.91	50.6	53.66
Total Annual Costs	87.28	103.97	76.69	72.01	77.64	72.98	80.00	93.38	96.44	106.54	113.59	125.08

Table I-1A: INDUSTRY COST OF EXISTING CHEMICAL REGULATION PURSUANT TO TSCA SECTIONS 4, 6, 8 & 12

(millions of 1986 dollars)

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Capital (a)	89.29	89.29	89.29	89.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Annual											
Capital (b)	79.85	88.28	96.70	105.13	105.13	105.13	105.13	105.13	105.13	105.13	105.13
O & M (c)	50.25	47.85	46.14	45.11	41.99	41.15	40.49	39.84	39.23	38.65	38.09
Total Annual Costs	130.10	136.13	142.84	150.24	147.12	146.28	145.62	144.97	144.36	143.78	143.22

Footnotes for Tables I-1 and I-1A

(a) Reflects the capital costs associated with three separate regulations under TSCA Section 6 restricting the manufacture, use, and distribution of PCBs. The estimates were derived from the RIAs for these rules and compiled by OTS staff.

(b) Reflect capital costs associated with PCB rules annualized at 7 percent over 20 years.

(c) Reflect O&M costs associated with PCB rules plus O&M costs for 24 chemical testing rules under TSCA Section 4; 34 Section 8(d) rules for submission of unpublished health and safety studies; 39 8(a) rules for submission of production information (including the 1977 TSCA Inventory, the 1986 Inventory Update, and the comprehensive Assessment Information Rule) and; Section 12(b) for export notification. All estimates were derived from the RIAs for the above rules and compiled by OTS staff.

Table I-2: INDUSTRY COST OF NEW CHEMICAL REGULATION PURSUANT TO TSCA SECTION 5

(millions of 1986 dollars)

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
PMN Filing Costs (a)	0.05	1.77	3.33	4.54	6.76	5.95	7.05	7.95	8.06	10.65
5(E) SNUR w/o testing (b)	0.00	0.01	0.00	0.01	0.05	0.10	0.18	0.23	0.20	0.12
5(E) SNUR with Ecotox testing (c)	0.00	0.03	0.07	0.04	0.23	0.12	0.11	0.16	0.11	0.19
5(E) SNUR with Health testing (d)	0.00	0.07	0.12	0.08	0.27	0.15	0.14	0.20	0.15	0.23
Total Annual Costs	0.05	1.87	3.52	4.68	7.32	6.32	7.48	8.54	8.53	11.18

Table I-2A: INDUSTRY COST OF NEW CHEMICAL REGULATION PURSUANT TO TSCA SECTION 5*

(millions of 1986 dollars)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
PMN Filing Costs (a)	--	--	--	--	--	--	--	--	--	--	--	--
5(E) SNUR w/o testing (b)	--	--	--	--	--	--	--	--	--	--	--	--
5(E) SNUR with Ecotox testing (c)	--	--	--	--	--	--	--	--	--	--	--	--
5(E) SNUR with Health testing (d)	--	--	--	--	--	--	--	--	--	--	--	--
Total Annual Costs	11.92	13.01	14.10	15.18	16.27	17.36	18.44	19.53	20.61	21.70	22.79	23.87

Footnotes for Tables I-2 and I-2A

* Data for PMNs and SNURs for years 1989-2000 were not supplied by OTS staff, and projections were made for the totals of these actions only and not for each individual category. The total annual costs associated with all PMNs and SNURs for the years 1989-2000 were projected by regressing the total annual costs for these categories over the years 1972-1988 against time.

(a) Reflect annual costs of filing pre-manufacturing (PMN) review notices prior to the manufacture, process, or import of new chemicals not on the TSCA Inventory. Estimates were calculated by OTS staff based on an average cost of $4,700 per PMNS submission.

(b) Reflect annual costs of Significant New Use Rule (SNUR) requirements that do not require additional testing. Estimates were derived from economic analyses and compiled by OTS staff.

(c) Same as b except include requirements for testing of ecological effects (Ecotox).

(d) Same as b except include requirements for Ecotox testing.

Table I-3: EPA COST OF NEW CHEMICAL REGULATION PURSUANT TO TSCA SECTION 5

(millions of 1986 dollars)

	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
PMN Filing Costs (a)	0.00	4.43	8.37	11.39	16.98	14.95	17.71	19.95	20.24	26.73
5(E) SNUR w/o testing (b)	0.00	0.05	0.00	0.04	0.21	0.40	0.71	0.91	0.81	0.47
5(E) SNUR with Ecotox testing (c)	0.00	0.02	0.16	0.07	0.60	0.28	0.25	0.42	0.28	0.50
5(E) SNUR with Health testing (d)	0.00	0.02	0.16	0.07	0.60	0.28	0.25	0.42	0.28	0.50
Total Annual Costs	0.00	4.52	8.68	11.59	18.40	15.90	18.93	21.70	21.60	28.19

Table I-3A: EPA COST OF NEW CHEMICAL REGULATION PURSUANT TO TSCA SECTION 5*

(millions of 1986 dollars)

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
PMN Filing Costs (a)	--	--	--	--	--	--	--	--	--	--	--	--
5(E) SNUR w/o testing (b)	--	--	--	--	--	--	--	--	--	--	--	--
5(E) SNUR with Ecotox testing (c)	--	--	--	--	--	--	--	--	--	--	--	--
5(E) SNUR with Health testing (d)	--	--	--	--	--	--	--	--	--	--	--	--
Total Annual Costs	30.18	32.95	35.72	38.49	41.25	44.02	46.79	49.56	52.33	55.0[illegible]	57.86	60.63

Footnotes for Tables I-3 and I-3A

* Data for PMNs and SNURs for years 1989-2000 were not supplied by OTS staff, and projections were made for the totals of these actions only and not for each individual category. The total annual costs of reviewing all PMNs and SNURs for the years 1989-2000 were projected by regressing the total annual costs for these categories over the years 1972-1988 against time.

(a) Reflect annual costs of reviewing pre-manufacturing (PMN) review notices prior to the manufacture, process, or import of new chemicals not on the TSCA Inventory. Estimates were calculated by OTS staff based on an average cost of $11,800 per PMN submission reviewed.

(b) Reflect annual costs of imposing Significant New Use Rule (SNUR) requirements that do not require additional testing. Estimates were derived from economic analyses and compiled by OTS staff.

(c) Same as b except include requirements for testing of ecological effects.

(d) Same as b except include requirements for Ecotox testing.

Table I-4: SUMMARY TABLE FOR TSCA

(millions of 1986 dollars)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Capital Costs															
Private							20	0	0	0	43	23	121	120	117
Operating Costs															
EPA for New Chem								0	5	9	12	18	16	19	22
Private							85	102	77	74	76	72	67	70	63

Table I-4A: SUMMARY TABLE FOR TSCA

(millions of 1986 dollars)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Capital Costs															
Private	117	114	110	89	89	89	89	89	0	0	0	0	0	0	0
Operating Costs															
EPA for New Chem	22	22	28	30	33	36	38	41	44	47	50	52	55	58	61
Private	63	62	62	66	63	62	61	61	59	60	60	60	61	61	62

Footnotes for Tables I-4 and I-4A

Private Capital Costs: From Tables I-1 and I-1A, first line.

EPA: Cost of new chemical regulation only from Table I-3, last line.

Private Operating Costs: Sum of "O & M" line from Tables I-1 and I-1A and the last line of Tables I-2 and I-2A.

APPENDIX J
ESTIMATION OF PESTICIDE CONTROL COSTS

This appendix provides background data and documentation for the individual components of pesticide control costs presented in Chapter 6. The data reflect annual operation, maintenance, and administrative costs only (capital costs are insignificant) for the years 1972-2000. Costs are provided for four affected sectors: private industry, states, EPA, and the U.S. Department of Agriculture (USDA).

The private industry costs include costs to pesticide registrants (i.e. manufacturers) for compliance with various regulatory requirements, including research, packaging, disposal, and storage, as well as costs due to pesticide cancellations and suspensions. The private industry costs also include costs to agricultural pesticide users for farmworker safety and applicator certification/training. The time-series estimates for many of the cost categories are based on one data point for year 1980 derived from: *Regulatory Impact Analysis: Data Requirements for Registering Pesticides Under FIFRA* (1982). For the most part, estimates for years 1972-1980 are assumed to increase linearly from zero in year 1972 to the RIA estimate for year 1980. Estimates for years beyond 1980 are then either assumed to remain constant at 1980 levels or to grow annually by some fixed factor. For certain cost categories, estimates for years 1990-2000 are assumed to increase substantially due to new requirements that are expected to be promulgated in the near future. In most cases, these new requirements reflect new provisions pursuant to the 1988 FIFRA amendments.

Costs to states include costs associated with applicator certification and training, farmworker safety, and enforcement. U.S. Department of Agriculture (USDA) costs include those associated with assessing pesticide residues in food products, and applicator certification and training. EPA costs are primarily for administering FIFRA abatement and control programs, but also include grants made to states for applicator certification and training, and enforcement.

It should be noted that regulatory initiatives for controlling pesticides in groundwater are still in the developmental stage. Should EPA adopt an aggressive policy in this area, future costs could be considerably greater than those shown.

Table J-1: PRIVATE COMPLIANCE COSTS FOR FIFRA

(millions of 1986 dollars)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
FIFRA Related R&D (a)															
NACA Firms	38.90	47.72	54.33	59.59	77.74	101.01	109.18	113.87	125.67	121.03	133.49	141.59	140.28	211.50	186.00
Other Firms	4.58	4.34	6.04	5.59	7.07	10.10	11.08	11.68	12.03	12.22	13.81	14.38	13.82	21.56	19.00
Child res. packaging (b)	0.00	0.52	0.97	1.34	1.70	2.02	2.28	2.45	2.27	3.41	4.46	5.50	6.44	7.34	7.64
Reg. of establishments (c)	0.00	0.85	1.57	2.16	2.74	3.27	3.69	3.96	4.14	3.94	3.86	3.86	3.86	3.87	3.92
Books/records (d)	0.00	2.23	4.12	5.72	7.24	8.64	9.75	10.48	10.96	10.43	10.21	10.20	10.19	10.25	10.38
Inspections (e)	0.00	0.09	0.16	0.20	0.27	0.32	0.36	0.38	0.40	0.38	0.37	0.38	0.37	0.37	0.38
Disp/Storage (exRCRA) (f)	21.62	21.34	20.62	19.89	19.66	19.51	19.10	18.36	17.51	16.65	16.31	16.31	16.29	16.37	16.58
Farmworker Safety (g)	0.00	0.00	22.13	20.48	19.43	18.52	18.99	17.52	16.04	14.67	14.96	14.38	14.88	15.40	16.00
Applic. cert./training (h)	0.00	0.00	0.00	0.00	79.51	67.34	61.71	52.55	44.12	46.45	46.03	46.46	47.82	49.28	52.00
Fees (registration) (i)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cancellations/Suspensions (j)															
past	0.00	32.71	29.52	24.97	45.39	42.51	110.30	160.91	121.51	100.90	72.51	47.05	111.59	40.26	29.95
future	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals	65.10	109.80	139.46	139.94	260.74	273.23	346.41	392.16	354.67	330.09	316.00	300.10	365.54	376.19	341.85

Table J-1A: PRIVATE COMPLIANCE COSTS FOR FIFRA

(millions of 1986 dollars)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
FIFRA Related R&D (a)															
NACA Firms	186.00	167.15	179.27	198.88	220.35	243.70	269.84	298.79	330.53	366.01	405.23	449.11	497.67	550.89	609.71
Other Firms	19.00	16.43	17.74	19.61	22.41	24.28	27.08	29.88	32.68	36.41	40.15	44.82	49.49	55.09	60.69
Child res. packaging (b)	7.64	7.88	8.12	8.42	8.52	8.62	8.72	8.83	8.93	9.04	9.15	9.26	9.37	9.48	9.60
Reg. of establishments (c)	3.92	3.94	3.96	3.96	3.96	3.96	3.96	3.96	3.96	3.96	3.96	3.96	3.96	3.96	3.96
Books/records (d)	10.38	10.43	10.48	10.48	10.48	10.48	10.48	10.48	10.48	10.48	10.48	10.48	10.48	10.48	10.48
Inspections (e)	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Disp./Storage (exRCRA) (f)	16.58	16.66	16.74	17.41	20.02	22.22	24.67	27.38	30.39	33.73	37.44	41.56	46.13	51.21	56.84
Farmworker Safety (g)	16.00	15.46	14.94	88.70	154.06	154.06	154.06	154.06	154.06	154.06	154.06	154.06	154.06	154.06	154.06
Applic. cert./training (h)	52.00	52.17	51.35	54.15	56.02	85.90	56.02	57.89	59.76	61.62	63.49	65.36	67.23	69.09	70.96
Fees (registration) (i)	0.00	0.00	0.00	37.25	32.96	13.59	14.14	14.71	15.29	15.91	16.55	17.21	0.00	0.00	0.00
Cancellations/Suspensions (j)															
past	29.95	88.15	67.10	48.03	38.28	28.94	19.61	9.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00
future	0.00	0.00	0.00	65.36	268.91	397.76	489.26	543.42	560.22	560.22	560.22	560.22	560.22	560.22	560.22
Totals	341.85	378.64	370.08	552.64	836.35	993.89	1078.22	1159.10	1206.69	1251.84	1301.11	1356.42	1398.99	1464.87	1536.91

Footnotes for Table J-1 and J-1A

(a) Research and Development costs (include regulation-related expenditure on toxicology, metabolism, environmental chemistry, residue analysis, and registration). Estimates for National Agricultural Chemicals Association (NACA) firms for the years 1972-1987 are based on annual surveys of basic producers, performed by NACA. Estimates for NACA firms for the years 1988-2000 are based on an assumed 10.75% annual rate of growth over 1987 base level. Estimates for other firms are based on the assumption that firms which are not part of the NACA incur an amount equal to about 10 percent of the R&D costs incurred by the NACA firms.

(b) All estimates are based on two data points: one for year 1980 that was estimated in *Regulatory Inpact Analysis: Data Requirements for Registering Pesticides under FIFRA (1982)*, p. 97 (hereinafter referred to as the 1982 RIA), and one for 1985 based on OPP staff calculation of full compliance costs. Estimates for years 1972-1979 are assumed to start at zero and increase linearly until the 1980 estimate is reached. Estimates for 1981-1985 are assumed to increase linearly from the 1980 base estimate until the OPP estimate of full compliance is reached in 1985. For years 1986-2000, costs are assumed to rise by 1.2% per year, reflecting growth in the number of products requiring packaging.

(c) (d) and (e) Estimates are based on the estimate for year 1980 given in the 1982 RIA. Estimates for years 1972-1979 are assumed to start at zero and increase linearly until the 1980 estimate is reached. Estimates for years 1980-2000 are assumed to remain constant at 1980 levels.

(f) Same as footnote C, except that costs for years 1990-2000 are assumed to increase over 1989 levels by 11.5% anually to reflect expanded requirements for disposal and storage expected to be implemented within the next several years.

(g) Based on EPA Office of Pesticide Programs (OPP) staff estimates. Estimates for years 1989 and 1990 reflect new requirements pursuant to a proposed rule to revise worker protection standards (53 FR 25970; 7/8/88) derived from the RIA for this rule. Estimates for 1991-2000 assumed to remain constant at year 1990 estimated level.

(h) Estimate for year 1980 comes from the 1982 RIA. Estimates for years 1976-1979 and 1981-2000 based on OPP staff estimates. Estimate for year 1991 reflects expanded certification and training expected to be promulgated within the next few years, which is expected to significantly raise compliance costs in year 1991 only. Estimates for 1992-2000 based on 1990 estimate plus an assumed annual 3% growth rate.

(i) Reflect two fees pursuant to the 1988 FIFRA amendments: 1) Product registration and maintenance fee; and 2) Active Ingredient registration fee. The product registration fee is an annual fee for each registered product that runs for nine years only, beginning in 1989. Cost estimates for this fee are based on an assumed 18,000 product registrants in 1989, and an additional 18,000 in 1990. The Active Ingredient (AI) fee is a one-time fee for each AI. Cost estimates for this fee are based on a total of 419 AIs, 60% of which pay fees in 1989, and the remainder in 1990.

(j) Reflect costs for past and expected future pesticide cancellations/suspensions. Data and documentation for individual pesticide actions are presented in Tables J-1B and J-1C.

Table J-1B: PESTICIDE CANCELLATION/SUSPENSION COSTS, 1972-86

(millions of 1986 dollars)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Past Actions															
DDT		32.71	29.52	24.97	20.21	14.90	9.91	5.37							
A/D-C/H					25.18	21.20	18.23	15.99	12.29	7.60	3.71				
Mercury															
Paint						6.41	4.81	3.49	1.76						
Other Uses							9.18	7.37	4.96	2.44					
Kepone															
Chlorobenzilate									0.27	0.23	0.21	0.17	0.14	0.11	0.83
Endrin									2.94	2.48	2.01	1.55	1.14	0.72	0.32
DBCP							68.18	63.58	42.89	42.05	30.69	19.62	9.57		
2,4,5T/Silvex								65.11	56.40	46.09	35.89	25.71	16.79		
EDB															
Soil													51.01	39.43	28.80
Fruit													32.94		
Total Past Actions	0.00	32.71	29.52	24.97	45.39	42.51	110.30	160.91	121.51	100.90	72.51	47.05	111.59	40.26	29.95

Footnotes for Table J-1B

Based on EPA Office of Pesticide Programs (OPP) staff estimates.

Table J-1C: PROJECTED PESTICIDE CANCELLATION/SUSPENSION COSTS, 1986-2000

(millions of 1986 dollars)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Past Actions (a)															
Chlorobenzilate	0.83	0.62	0.43	0.22	0.00										
Endrin	0.32	0.58	0.37	0.19	0.00										
EDB															
Soil	28.80	18.36	9.34	0.00											
Fruit															
Dinoseb		68.60	56.96	47.62	38.28	28.94	19.61	9.34							
Total Past Actions	29.95	88.15	67.10	48.03	38.28	28.94	19.61	9.34							
Future actions															
Bromoxynil (a)				65.36	82.17	61.62	41.08	20.54							
Other future actions (b)					186.74	336.13	448.18	522.88	560.22	560.22	560.22	560.22	560.22	560.22	560.22
Total Future Actions				65.36	268.91	397.76	489.26	543.42	560.22	560.22	560.22	560.22	560.22	560.22	560.22
Totals	29.95	88.15	67.10	113.39	307.19	426.70	508.87	552.75	560.22	560.22	560.22	560.22	560.22	560.22	560.22

Footnotes for Table J-1C

(a) Based on EPA Office of Pesticide Programs (OPP) staff estimates.

(b) Future costs are based on an assumed three actions per year at an initial cost of $200 million each in 1988 dollars (1 major at $100M, 1 intermediate at $75M, 1 minor at $25M). Initial costs for each action are assumed to decrease linearly to zero in six years.

Table J-2: STATE COMPLIANCE COSTS FOR FIFRA

(millions of 1986 dollars)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Certification/Training (a)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.55	5.21	3.67	3.11	2.21	2.23	2.77	2.50
Enforcement (b)	0.46	0.43	0.40	0.37	0.35	2.53	12.03	19.42	17.51	14.55	14.96	14.38	13.82	14.99	14.00
Farm Worker Safety (c)	0.00	0.00	0.00	0.37	0.35	0.34	0.32	0.44	0.40	0.37	0.35	0.55	0.53	0.51	0.50
Cancellation/Suspensions (d)															
Product Registration (e)															
Registration Fees (f)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals	0.46	0.43	0.40	0.74	0.71	2.86	12.34	25.40	23.13	18.58	18.41	17.15	16.58	18.28	17.00

Table J-2A: STATE COMPLIANCE COSTS FOR FIFRA

(millions of 1986 dollars)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Certification/Training (a)	2.50	2.61	2.52	3.27	2.52	3.27	2.61	2.71	2.80	2.89	2.99	3.08	3.17	3.27	3.36
Enforcement (b)	14.00	12.66	12.23	12.32	12.89	13.45	13.91	14.38	14.94	15.50	16.62	16.81	17.55	18.21	18.86
Farm Worker Safety (c)	0.50	0.48	0.47	7.00	3.27	3.27	3.27	7.47	3.73	3.73	3.73	3.73	8.40	4.67	4.67
Cancellation/Suspensions (d)															
Product Registration (e)															
Registration Fees (f)	0.00	0.00	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.00	0.00	0.00
Totals	17.00	15.75	16.15	23.53	19.61	20.92	20.73	25.49	22.41	23.06	24.28	24.56	29.13	26.14	26.89

Footnotes for Tables J-2 and J-2A

(a) Estimated at 1.5 times the amount of EPA grants (i.e. states assume 60 percent of total costs).

(b) For years 1972 - 1976: staff estimate of $200,000 is used.
For years 1977 - 2000: estimated at 1.5 times the amount of EPA grants (i.e. states assume 60 percent of total costs).

(c) Costs are based on EPA Office of Pesticide Programs (OPP) staff estimates.
(d) Cancellation/Suspension—minor, not estimated.
(e) Product Registration—not estimated.
(f) Registration Fees—very minor—$1 million/year. Years 1988-1997 only; reflecting nine-year period for fees pursuant to the 1988 FIFRA amendments.

Table J-3: EPA PESTICIDE PROGRAMS COSTS

(millions of 1986 dollars)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
FIFRA Appropriations (a)	26.25	32.95	34.65	35.70	52.16	54.61	38.64	57.34	52.74	50.31	39.53	35.88	37.86	45.83	41.02
Enforcement Grants (b)	0.00	0.00	0.00	0.00	0.00	1.70	7.99	12.91	11.70	9.68	10.01	9.62	9.25	9.98	9.32
Certification/ Training Grants (c)	0.00	0.00	0.00	0.00	13.25	8.08	3.64	5.11	4.81	3.55	2.88	2.10	2.13	2.67	2.50
Totals	26.25	32.95	34.65	35.70	65.41	64.39	50.27	75.36	69.25	63.53	52.42	47.61	49.23	58.48	52.84

Table J-3A: EPA PESTICIDE PROGRAMS COSTS

(millions of 1986 dollars)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
FIFRA Appropriations (a)	41.02	41.02	48.20	100.11	103.32	49.21	51.17	53.22	55.37	57.61	59.94	62.37	64.89	67.51	70.21
Enforcement Grants (b)	9.32	8.41	8.12	8.22	8.59	8.96	9.06	9.62	9.99	10.36	10.74	11.20	11.67	12.14	12.61
Certification/ Training Grants (c)	2.50	2.42	2.43	2.80	2.43	3.27	2.52	2.61	2.71	2.80	2.89	2.99	3.08	3.17	3.27
Totals	52.84	51.85	58.75	111.13	114.34	61.44	62.75	65.45	68.07	70.77	73.58	76.56	79.65	82.82	86.09

Footnotes for Tables J-3 and J-3A

(a) Estimates for years 1972-1987 are based on actual OPP budget data. Estimates for years 1988-1990 are based on actual OPP appropriations data that includes $6.8 million in disposal funds for FY 88 and $60 million in disposal funds for FY89 and FY90. Estimates for years 1991-2000 are based on 1989 base appropriations (i.e. without disposal funds) plus an assumed annual increase of four percent.

(b) Represent grants to states for FIFRA enforcement. Estimates for years 1977-1989 are based on actual OPP budget data. Estimates for years 1990-2000 are based on 1989 costs, plus an assumed annual growth of four percent.

(c) Represent grants to states for training and certification of pesticide applicators. Estimates for years 1976-1989 are based on actual OPP budget data. Estimates for years 1988-1991 are based on estimates from a draft RIA for new regulations currently under development. Estimates for years 1992-2000 are based on 1990 estimate plus an annual increase of $0.9 million.

Table J-4: NON-EPA FEDERAL (USDA ONLY) COMPLIANCE COSTS

(millions of 1986 dollars)

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Certification/Training (a) (in-kind matching funds)	0.00	0.00	0.00	0.00	13.25	8.08	3.64	5.11	4.81	3.55	2.88	2.10	2.13	2.67	2.50
NPIAP (b)	0.00	0.00	0.00	0.00	0.00	12.63	11.87	10.22	8.69	7.95	6.90	6.64	6.38	6.16	5.50
Totals	0.00	0.00	0.00	0.00	13.25	20.71	15.51	15.33	13.50	11.49	9.78	8.74	8.50	8.83	8.00

Table J-4A: NON-EPA FEDERAL (USDA only) COMPLIANCE COSTS

(millions of 1986 dollars)

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Certification/Training (a) (in-kind matching funds)	2.50	2.42	2.43	2.80	2.43	3.27	2.52	2.61	2.71	2.80	2.89	2.99	3.08	3.17	3.27
NPIAP (b)	5.50	5.31	4.67	4.67	4.67	4.67	4.67	4.67	4.67	4.67	4.67	4.67	4.67	4.67	4.67
Totals	8.00	7.73	7.10	7.47	7.10	7.94	7.19	7.28	7.38	7.47	7.56	7.66	7.75	7.84	7.94

Footnotes for Tables J-4 and J-4A

(a) In-kind matching funds provided by USDA to support certification and training programs equal in cost to EPA's grants in this area (OPP staff estimate).

(b) National Pesticide Impact Assessment Program - program of USDA. Staff estimates.